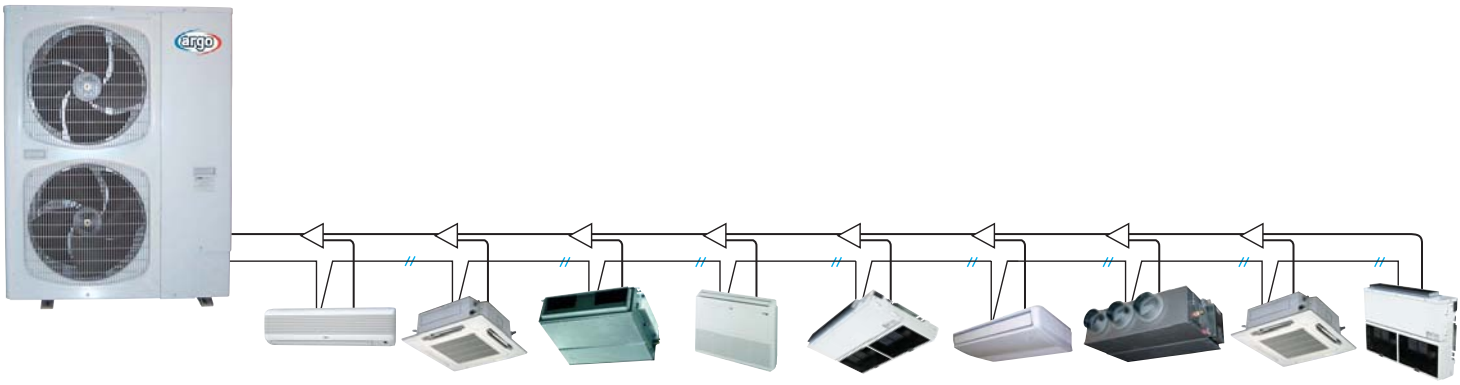
Improve your life

TECHNICAL DATA

MINI MULTISET V.R.F. DC INVERTER R410A
OUTDOOR UNITS



April 2008

MINI-MULTISET VRF DCI SYSTEMS

Line-up

R410A Models

Indoor Units

	Indoor Unit Type	22	28	36	45	56	64	73	106	140
AS1S**	1-Way Air Discharge Semi-Concealed	AS1S22MH	AS1S28MH	AS1S36MH						
ASBS**	1-Way Air Discharge S emi-C oncealed Slim		ASBS28MH	ASBS36MH		ASBS56MH		ASBS73MH		
AS2S**	2-Way Air Discharge Semi-Concealed	AS2S22MH	AS2S28MH	AS2S36MH		AS2S56MH		AS2S73MH		
ASS	4-Way Air Discharge Semi-Concealed	ASS22MH*	ASS28MH*	ASS36MH*	ASS45MH*G	ASS56MH*		ASS73MH*	ASS106MH*	ASS140MH*
AWS/AWF	Wall-mounted	AWS22MH AWF22MH	AWS28MH AWF28MH	AWS36MH AWF36MH		A WS56MH		AWS73MH		
ACS	Ceiling-mounted			ACS36MH**		ACS56MH**		ACS73MH	ACS106MH	ACS140MH
ADS	Concealed-Duct	ADS22MH*	ADS28MH*	ADS36MH*	AD45MHG*	ADS56MH*	AD64MHG*	ADS73MH	ADS106MH	ADS140MH
ADPS**	Concealed-Duct High-Static Pressure							ADPS73MH	ADPS106MH	ADPS140MH
AFS**	Floor-standing	AFS22MH	AFS28MH	AFS36MH		AFS56MH		AFS73MH		
AFNS**	Concealed-Floor Standing	AFNS22MH	AFNS28MH	A FNS36MH		AFNS56MH		AFNS73MH		
FC	Floor-Ceiling	FC22MHG*	FC28MHG*	FC36MHG*	FC45MHG*	FC56MHG*	FC64MHG*			
SD	Slim Ducted	SD22MHG*	SD28MHG*	SD36MHG*	SD45MHG*	SD56MHG*	SD64MHG*			

* For these Indoor Unit Types, please see the installation instructions inside the manual included in their package

**Indoor Unit Types not available

Outdoor Units

AES	Dc Inverter heat pump units	AES04MMIH, AES05MMIH, AES06MMIH

Refrigerant R410A is used in the outdoor units

Optional controllers

REM	Wired Remote Controller	REM HW
	Wireless Remote Controller (for ASS type)	REM HLASS
	Wireless Remote Controller (for FC & ASS types)	REM HLFC ASS
	Wireless Remote Controller (for ACS type)	REM HLACS
	Wireless R emote Controller + wal l receiver	REMHL + wall receiver for ASS/ACS/ADS/FC/SD
	Wireless Remote Controller (for AWS type)	REM HLA WS
	Simplified Remote Controller	REM HWSM
	Remote Sensor	RSM
	System Controller	REM HW64S
	Weekly Timer	REM HWT
	Wired Remote Controller + timer	REM HWTM

IMPORTANT!
Please Read Before Starting

This air conditioning system meets strict safety and operating standards. As the installer or service person, it is an important part of your job to install or service the system so it operates safely and efficiently.

For safe installation and trouble-free operation, you must:

- Carefully read this instruction booklet before beginning.
- Follow each installation or repair step exactly as shown.
- Observe all local, state, and national electrical codes.
- This product is intended for professional use. Permission from the power supplier is required when installing an outdoor unit that is connected to a 16 A distribution network.
- Pay close attention to all warning and caution notices given in this manual.

This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.

This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.

If Necessary, Get Help

These instructions are all you need for most installation sites and maintenance conditions. If you require help for a special problem, contact our sales/service outlet or your certified dealer for additional instructions.

In Case of Improper Installation

The manufacturer shall in no way be responsible for improper installation or maintenance service, including failure to follow the instructions in this document.

SPECIAL PRECAUTIONS

WARNING **When Wiring**

ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. ONLY A QUALIFIED, EXPERIENCED ELECTRICIAN SHOULD ATTEMPT TO WIRE THIS SYSTEM.

- Do not supply power to the unit until all wiring and tubing are completed or reconnected and checked.
- Highly dangerous electrical voltages are used in this system. Carefully refer to the wiring diagram and these instructions when wiring. Improper connections and inadequate grounding can cause **accidental injury or death.**
- **Ground the unit** following local electrical codes.
- Connect all wiring tightly. Loose wiring may cause overheating at connection points and a possible fire hazard.

When Transporting

Be careful when picking up and moving the indoor and outdoor units. Get a partner to help, and bend your knees when lifting to reduce strain on your back. Sharp edges or thin aluminum fins on the air conditioner can cut your fingers.

When Installing…

…In a Room

Properly insulate any tubing run inside a room to prevent "sweating" that can cause dripping and water damage to walls and floors.

…In Moist or Uneven Locations

Use a raised concrete pad or concrete blocks to provide a solid, level foundation for the outdoor unit. This prevents water damage and abnormal vibration.

…In an Area with High Winds

Securely anchor the outdoor unit down with bolts and a metal frame. Provide a suitable air baffle.

…In a Snowy Area (for Heat Pump-type Systems)

Install the outdoor unit on a raised platform that is higher than drifting snow. Provide snow vents.

When Connecting Refrigerant Tubing

- Ventilate the room well, in the event that is refrigerant gas leaks during the installation. Be careful not to allow contact of the refrigerant gas with a flame as this will cause the generation of poisonous gas.
- Keep all tubing runs as short as possible.
- Use the flare method for connecting tubing.
- Apply refrigerant lubricant to the matching surfaces of the flare and union tubes before connecting them, then tighten the nut with a torque wrench for a leak-free connection.
- Check carefully for leaks before starting the test run.

When Servicing

- Turn the power OFF at the main power box (mains) before opening the unit to check or repair electrical parts and wiring.
- Keep your fingers and clothing away from any moving parts.
- Clean up the site after you finish, remembering to check that no metal scraps or bits of wiring have been left inside the unit being serviced.

- Ventilate any enclosed areas when installing or testing the refrigeration system. Escaped refrigerant gas, on contact with fire or heat, can produce dangerously toxic gas.
- Confirm after installation that no refrigerant gas is leaking. If the gas comes in contact with a burning stove, gas water heater, electric room heater or other heat source, it can cause the generation of poisonous gas.

Check of Density Limit

The room in which the air conditioner is to be installed requires a design that in the event of refrigerant gas leaking out, its density will not exceed a set limit.

The refrigerant (R410A), which is used in the air conditioner, is safe, without the toxicity or combustibility of ammonia, and is not restricted by laws imposed to protect the ozone layer. However, since it contains more than air, it poses the risk of suffocation if its density should rise excessively. Suffocation from leakage of refrigerant is almost non-existent. With the recent increase in the number of high density buildings, however, the installation of multi air conditioner systems is on the increase because of the need for effective use of floor space, individual control, energy conservation by curtailing heat and carrying power, etc.

Most importantly, the multi air conditioner system is able to replenish a large amount of refrigerant compared to conventional individual air conditioners. If a single unit of the multi air conditioner system is to be installed in a small room, select a suitable model and installation procedure so that if the refrigerant accidentally leaks out, its density does not reach the limit (and in the event of an emergency, measures can be made before injury can occur).

In a room where the density may exceed the limit, create an opening with adjacent rooms, or install mechanical ventilation combined with a gas leak detection device. The density is as given below.

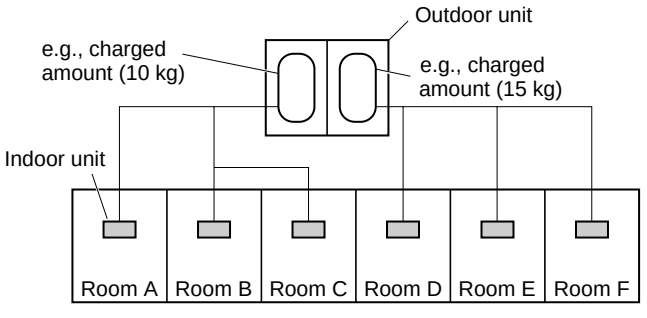
$$\frac{\textbf{Total amount of refrigerant (kg)}}{\textbf{Min. volume of the indoor unit installed room (m}^3\textbf{)}} \leq \textbf{Density limit (kg/m}^3\textbf{)}$$

The density limit of refrigerant which is used in multi air conditioners is 0.3 kg/m^3 (ISO 5149).

NOTE

1. If there are 2 or more refrigerating systems in a single refrigerating device, the amount of refrigerant should be as charged in each independent device.

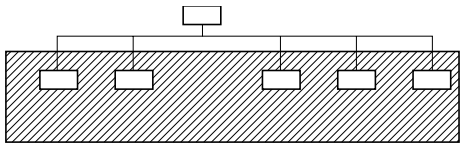
For the amount of charge in this example:



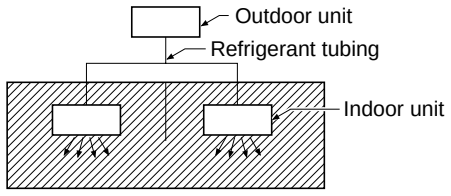
The possible amount of leaked refrigerant gas in rooms A, B and C is 10 kg.
The possible amount of leaked refrigerant gas in rooms D, E and F is 15 kg.

2. The standards for minimum room volume are as follows.

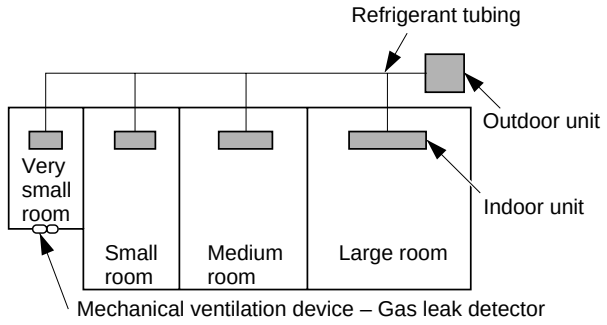
(1) No partition (shaded portion)



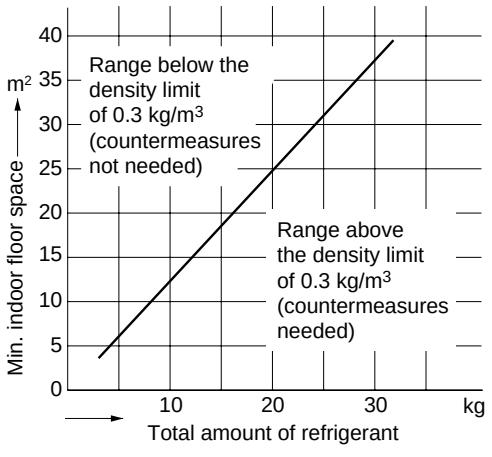
(2) When there is an effective opening with the adjacent room for ventilation of leaking refrigerant gas (opening without a door, or an opening 0.15% or larger than the respective floor spaces at the top or bottom of the door).



(3) If an indoor unit is installed in each partitioned room and the refrigerant tubing is interconnected, the smallest room of course becomes the object. But when mechanical ventilation is installed interlocked with a gas leakage detector in the smallest room where the density limit is exceeded, the volume of the next smallest room becomes the object.



3. The minimum indoor floor space compared with the amount of refrigerant is roughly as follows: (When the ceiling is 2.7 m high)



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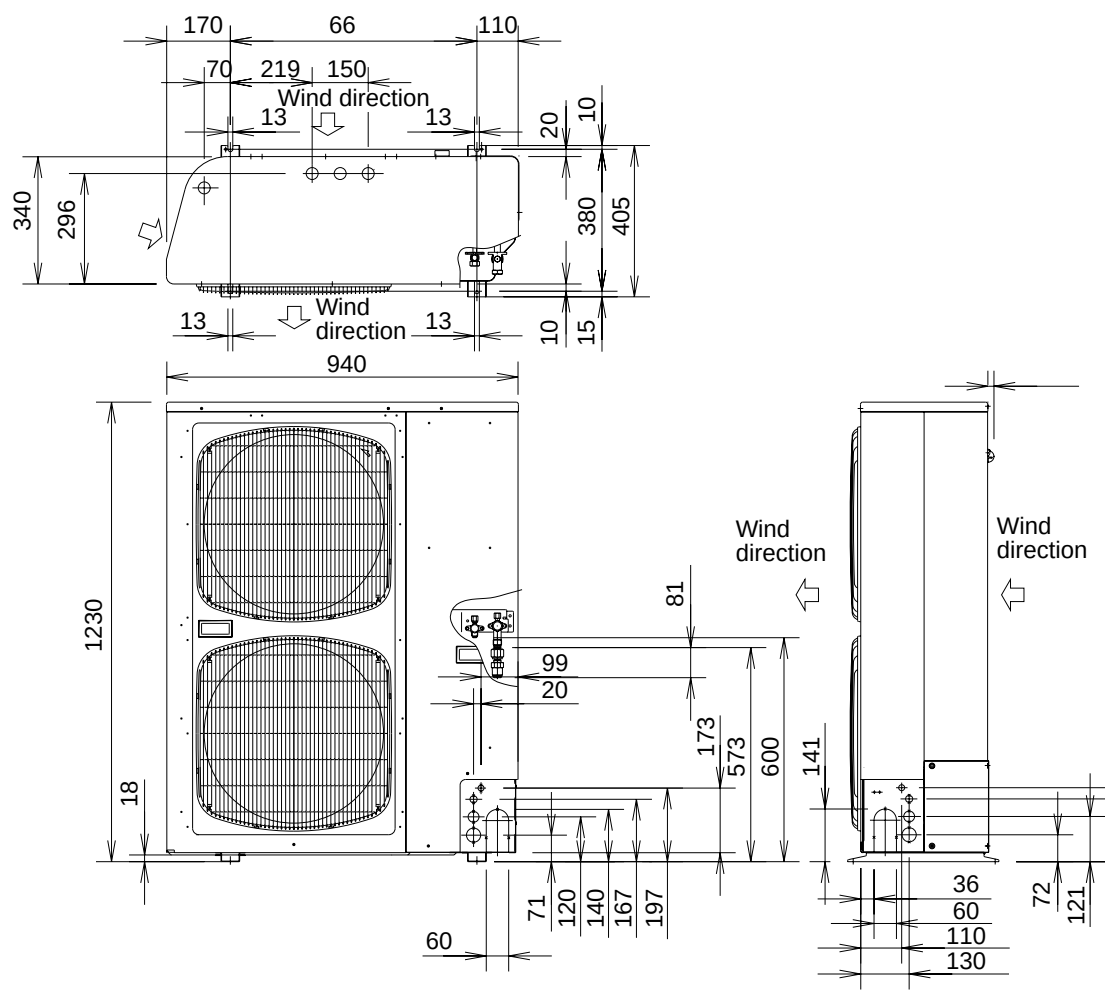
Contents

1. Outiline of Mini Multiset

1. Line-up **1-2**

1. Line-up

Outdoor units

Type	DC inverter unit		
	AES 04 MMIH	AES 05 MMIH	AES 06 MMIH
Capacity: kW (BTU/h)	11.2 (38,200)	14.0 (47,800)	15.5 (52,900)
Cooling / Heating	/ 12.5 (42,700)	/ 16.0 (54,600)	/ 17.6 (60,000)
Outdoor Unit			

AES 04 MMIH AES 05 MMIH AES 06 MMIH

2. Design of Mini Multiset

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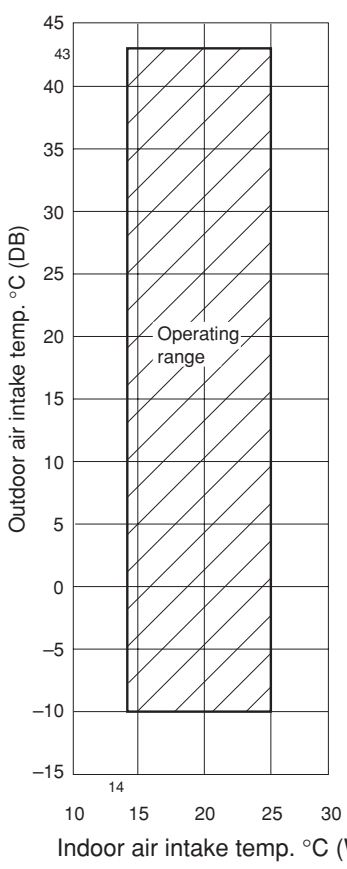
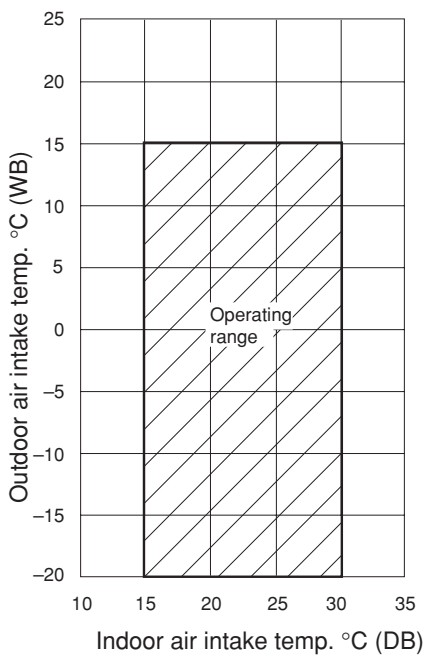
1. Model Selecting and Capacity Calculator

1-1. Operating Range

Cooling



Heating



1. Model Selecting and Capacity Calculator

1-2. Procedure for Selecting Models and Calculating Capacity

■ Model Selection Procedure

Select the model and calculate the capacity for each refrigerant system according to the procedure shown below.

Calculation of the indoor air-conditioning load
- Calculate the maximum air-conditioning load for each room or zone.

↓

Selection of an air conditioning system
- Select the ideal air conditioning system for air conditioning of each room or zone.

↓

Design of the control system
- Design a suitable control system for the selected air conditioning system.

↓

Preliminary selection of indoor and outdoor units
- Make preliminary selections that are within the allowable range for the system. 2-2

↓

Check of the tubing length and elevation difference
- Check that the length of refrigerant tubing and the elevation difference are within the allowable ranges. ..... 2-4, 2-15 – 2-16

↓

Calculation of the corrected outdoor unit capacity
- Capacity correction coefficient for outdoor temperature conditions .....2-4, 2-6 – 2-7
- Capacity correction coefficient for tubing length and elevation difference 2-4, 2-8
- Heating capacity correction coefficient for frosting/defrosting 2-4, 2-7

↓

Calculation of the corrected capacity for each indoor unit
- Capacity correction coefficient for indoor temperature conditions.....2-4, 2-8
- Capacity distribution ratio based on the tubing length and elevation difference....2-4, 2-15 – 2-16

↓

Calculation of the actual capacity for each indoor unit
- Calculate the corrected indoor/outdoor capacity ratio, based on the corrected outdoor unit capacity and the total corrected capacity of all indoor units in the same system. Use the result to calculate the capacity correction coefficient for the indoor units. .....2-4 – 2-8
- Multiply the corrected capacity of each indoor unit by the capacity correction coefficient to calculate the actual capacity for each indoor unit. 2-6

↓

Recheck of the actual capacity for each indoor unit
- If the capacity is inadequate, reexamine the unit combinations.
  Example 1: Increasing the outdoor unit capacity ..... 2-17 – 2-18
  Example 2: Increasing the indoor unit capacity ..... 2-17 – 2-18

↓

Design of tubing
- Create a tubing design which minimizes the amount of additional refrigerant charge as much as possible. .....2-14 – 2-15
- If tubing extension is expected in the future, create the tubing design with adequate consideration for this extension.
- Select the tubing size for the main tube (LA) up to the No. 1 distribution joint based on the rated cooling capacity of the outdoor unit. Select tubing sizes after the distribution point based on the total rated cooling capacity of the connected indoor units.

↓

Calculation of additional refrigerant charge amount
- Calculate the additional refrigerant charge from the diameters and lengths of the refrigerant tubing. Even if the gas tubing diameter was increased, determine the additional refrigerant charge based only on the liquid tubing size. 2-21
- Check the minimum indoor capacity (limit density) with respect to the amount of refrigerant. If the limit density is exceeded, be sure to install ventilation equipment or take other corrective steps. 2-22

↓

Design of electrical wiring capacity
- Select a wiring capacity according to the method of power supply. 2-32

1. Model Selecting and Capacity Calculator

1-3. Calculation of Actual Capacity of Indoor Unit

■ Calculating the actual capacity of each indoor unit

Because the capacity of a multi air-conditioner changes according to the temperature conditions, tubing length, elevation difference and other factors, select the correct model after taking into account the various correction values. When selecting the model, calculate the corrected capacities of the outdoor unit and each indoor unit. Use the corrected outdoor unit capacity and the total corrected capacity of all the indoor units to calculate the actual final capacity of each indoor unit.

1. Outdoor unit capacity correction coefficient

Find the outdoor unit capacity correction coefficient for the following items.

(1) Capacity correction for the outdoor unit temperature conditions
From the graph of capacity characteristics on page 2-6, use the outdoor temperature to find the capacity correction coefficient.

(2) Capacity correction for the outdoor unit tubing length and elevation difference
From the graph of capacity change characteristics on page 2-7, use the tubing length and elevation difference to find the capacity correction coefficient.
The outdoor unit correction coefficient is the value which corresponds to the most demanding indoor unit.

(3) Capacity correction for outdoor unit frosting/defrosting during heating
From the table on page 2-7, find the capacity correction coefficient.

2. Indoor unit capacity correction coefficients

Find the indoor unit capacity correction coefficient for the following items.

(1) Capacity correction for the indoor unit temperature conditions
From the graph of capacity characteristics on page 2-8, use the indoor temperature to find the capacity correction coefficient.

(2) Capacity distribution ratio based on the indoor unit tubing length and elevation difference
First, in the same way as for the outdoor unit, use the tubing length and elevation difference for each indoor unit to find the correction coefficient from the graph of capacity change characteristics on page 2-8. Then divide the result by the outdoor unit correction coefficient to find the capacity distribution ratio for each indoor unit.

Capacity distribution ratio for each indoor unit (2) = Correction coefficient for that indoor unit / Correction coefficient for the outdoor unit

3. Calculating the corrected capacities for the outdoor unit and each indoor unit

The corrected capacities for the outdoor unit and each indoor unit are calculated form the formula below.

<Cooling>

- Outdoor unit corrected cooling capacity (5) = Outdoor unit rated cooling capacity × Correction coefficient for outdoor temperature conditions ((1) Page 2-6) × Correction coefficient for tubing length and elevation difference ((2) Page 2-8)

  * However, if the outdoor unit corrected cooling capacity [5] is greater than 100%, then the outdoor unit corrected cooling capacity [5] is considered to be 100%.

- Corrected cooling capacity of each indoor unit (5) = Rated cooling capacity for that indoor unit × Correction coefficient for indoor temperature conditions at that indoor unit ((1) Page 2-7) × Distribution ratio based on tubing length and elevation difference at that indoor unit ((2) Page 2-8)

However, the corrected cooling capacity of each indoor unit is found as shown below.
If (1) < 100% and (1) × (2) > 100%: Corrected cooling capacity for that indoor unit [5] = Rated cooling capacity for that indoor unit
If (1) ≥ 100%: Corrected cooling capacity for that indoor unit (5) = Rated cooling capacity for that indoor unit × (1)

1. Model Selecting and Capacity Calculator

<Heating>

- Outdoor unit corrected heating capacity (5) = Outdoor unit rated heating capacity × Correction coefficient for outdoor temperature conditions ((1) Page 2-6) × Correction coefficient for tubing length and elevation difference ((2) Page 2-8) × Correction coefficient for frosting/defrosting ((2) Page 2-7)

  * However, if the outdoor unit corrected heating capacity [5] is greater than 100%, then the outdoor unit corrected heating capacity is considered to be 100%.

- Corrected heating capacity of each indoor unit (5) = Rated heating capacity for that indoor unit × Correction coefficient for indoor temperature conditions at that indoor unit ((1) Page 2-6) × Distribution ratio based on tubing length and elevation difference at that indoor unit ((2) Page 2-8).

However, the corrected heating capacity of each indoor unit is found as shown below.
If (1) < 100% and (1) × (2) > 100%: Corrected heating capacity for that indoor unit (5) = Rated heating capacity for that indoor unit
If (1) ≥ 100%: Corrected heating capacity for that indoor unit (5) = Rated heating capacity for that indoor unit × (1)

  * Characteristic graphs are shown on the pages listed above next to each correction item.
    Find each correction coefficient from the appropriate conditions.

4. Calculating the actual indoor unit capacity based on the indoor/outdoor corrected capacity ratio

Calculate the actual capacity of each indoor unit from the values (found in (3)) for the corrected outdoor unit capacity and the corrected capacity of each indoor unit.

<Cooling capacity>

Corrected indoor/outdoor capacity ratio during cooling (Ruc) = Total corrected cooling capacity of all indoor units in that system / Corrected outdoor unit cooling capacity

If the corrected outdoor unit cooling capacity is greater than or equal to the total corrected unit cooling capacity of all indoor units in that system (Ruc ≤ 1), then:

Actual cooling capacity of each indoor unit (7) = Corrected cooling capacity of each indoor unit (5)
(In other words, the correction coefficient (6), based on the corrected indoor/outdoor capacity ratios for each indoor unit, is 1.)

If the corrected outdoor unit cooling capacity is less than the total corrected unit cooling capacity of all indoor units in that system (Ruc > 1), then:

(Actual cooling capacity of each indoor unit (7)) = (Corrected cooling capacity of each indoor unit (5)) × $\underline{(0.25 \times Ruc + 0.75) / Ruc}$
(In other words, the correction coefficient (6), based on the corrected indoor/outdoor capacity ratios for each indoor unit, is the underlined part in the formula above.)

<Heating capacity>

Corrected indoor/outdoor capacity ratio during heating (Ruh) = Total corrected heating capacity of all indoor units in that system / Corrected outdoor unit heating capacity

If the corrected outdoor unit heating capacity is greater than or equal to the total corrected unit heating capacity of all indoor units in that system (Ruh ≤ 1), then:

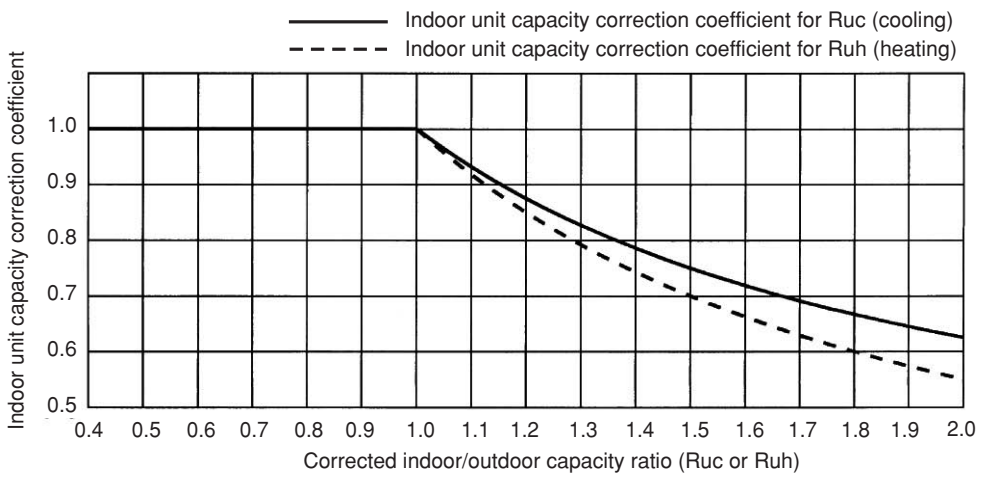
Actual heating capacity of each indoor unit (7) = Corrected heating capacity of each indoor unit (5)
(In other words, the correction coefficient (6), based on the corrected indoor/outdoor capacity ratios for each indoor unit, is 1.)

If the corrected outdoor unit heating capacity is less than the total corrected unit heating capacity of all indoor units in that system (Ruh > 1), then:

(Actual heating capacity of each indoor unit (7)) = (Corrected heating capacity of each indoor unit (5)) × $\underline{(0.1 \times Ruh + 0.9) / Ruh}$
(In other words, the correction coefficient (6), based on the corrected indoor/outdoor capacity ratios for each indoor unit, is the underlined part in the formula above.)

1. Model Selecting and Capacity Calculator

Refer to the graph below for the correction coefficients for Ruc and Ruh.

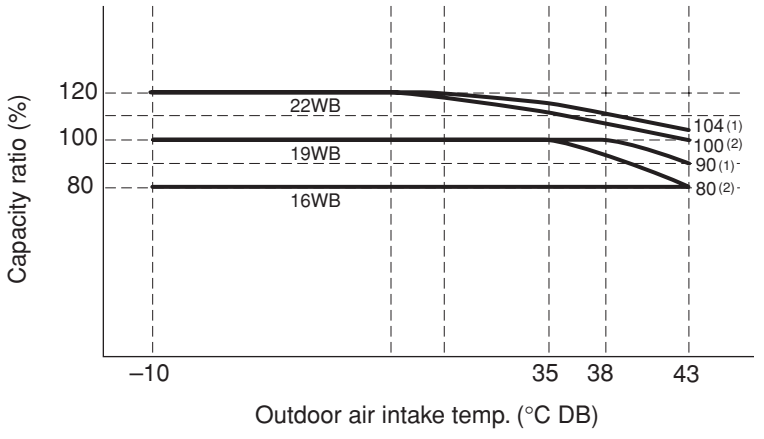

Indoor unit capacity correction coefficient for Ruc (cooling)
Indoor unit capacity correction coefficient for Ruh (heating)
Indoor unit capacity correction coefficient
1.0
0.9
0.8
0.7
0.6
0.5
0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0
Corrected indoor/outdoor capacity ratio (Ruc or Ruh)

Note: When Ruc or Ruh is less than or equal to 1.0, the indoor unit capacity correction coefficient for both Ruc and Ruh is 1.0.

5. Graph of capacity correction coefficients

■ **Graph of outdoor unit capacity characteristics (1 – (1))**

Outdoor unit cooling capacity characteristics



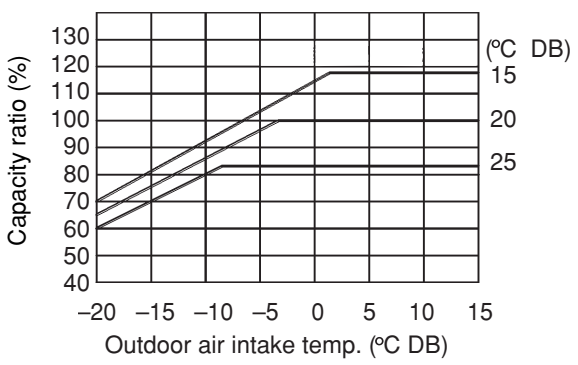
(1) AES 04 MMIH
AES 05 MMIH

(2) AES 06 MMIH

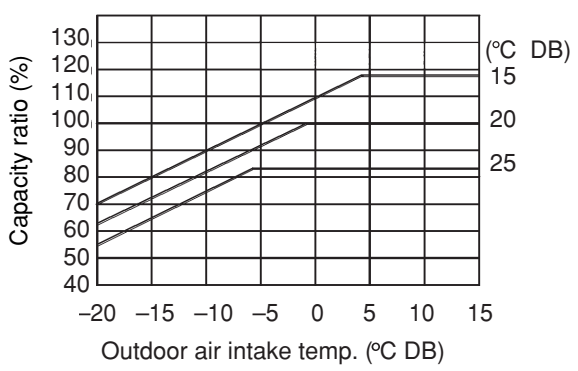
1. Model Selecting and Capacity Calculator

Outdoor unit heating capacity characteristics

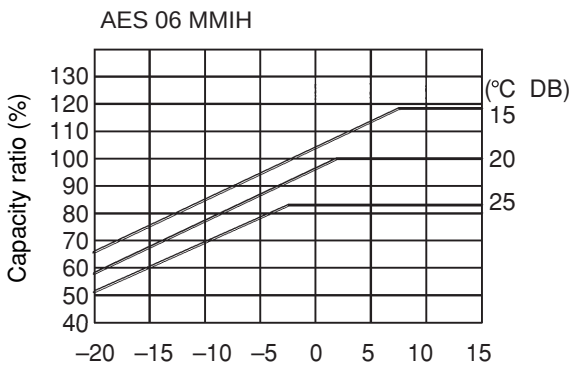
AES 04 MMIH



AES 05 MMIH



AES 06 MMIH



2

■ **Outdoor unit heating capacity correction coefficient during frosting/defrosting (1 – (2))**

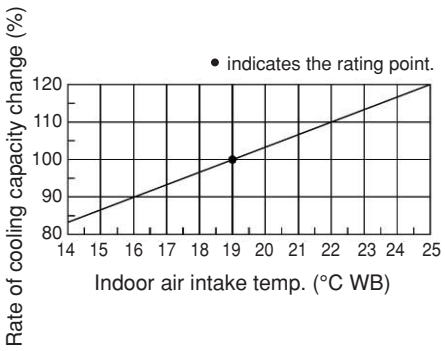
Outdoor intake air temp. (°C WB RH 85%)	–20	–15	–10	–8	–6	–5	–4	–2	–1	0	1	2	3	4	5	6
Correction coefficient	0.97	0.97	0.97	0.96	0.94	0.91	0.89	0.87	0.87	0.87	0.88	0.89	0.91	0.92	0.95	1.0

* To calculate the heating capacity with consideration for frosting/defrosting operation, multiply the heating capacity found from the capacity graph by the correction coefficient from the table above.

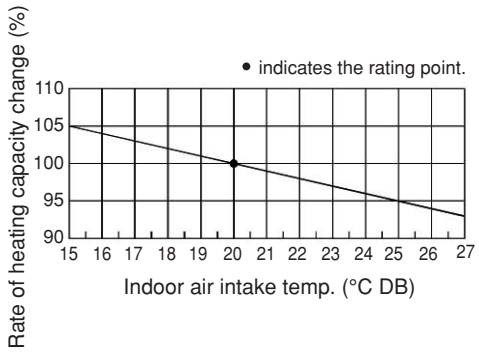
1. Model Selecting and Capacity Calculator

■ Graph of indoor unit capacity characteristics (2 – (1))

Indoor unit cooling capacity characteristics

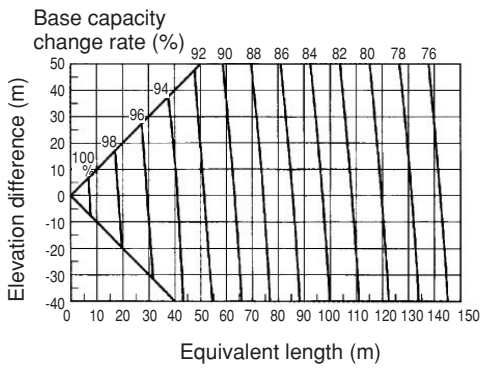


Indoor unit heating capacity characteristics

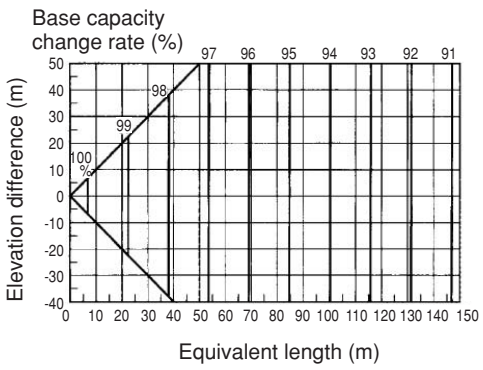


■ Graph of capacity change characteristics resulting from tubing length and elevation difference (1 • 2 – (2))

<Cooling>



<Heating>



The positive side for the elevation difference indicates that the outdoor unit is installed at a higher position than the indoor units. The negative side indicates the opposite.

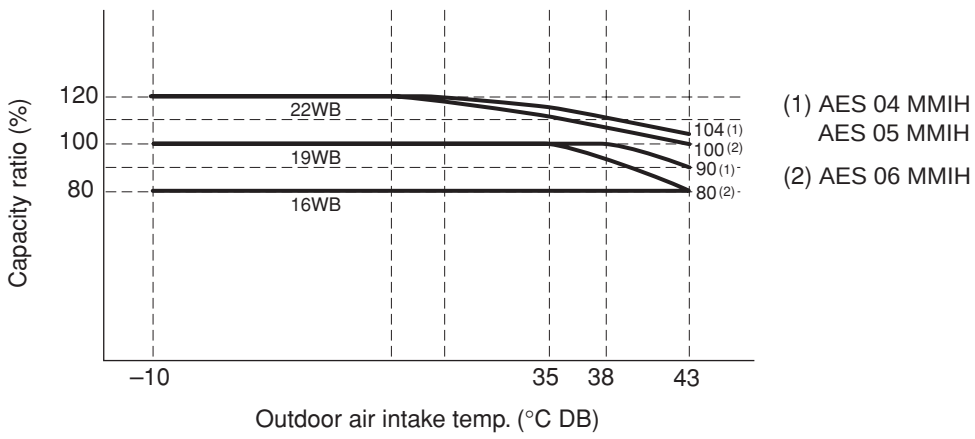
1. Model Selecting and Capacity Calculator

1-4. Capacity Correction Graph According to Temperature Condition

■ **Capacity characteristics**

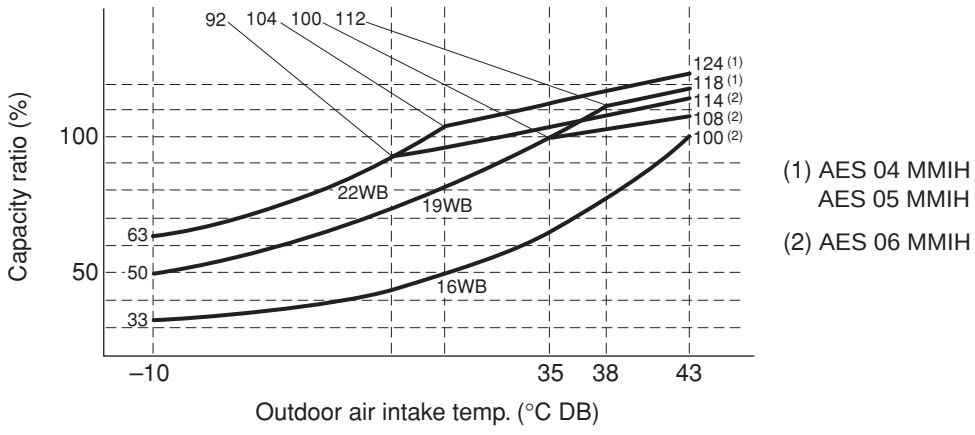
(The corrected capacity for specific temperature conditions can be found from the graphs below and next page.)

<COOLING>



(1) AES 04 MMIH
AES 05 MMIH

(2) AES 06 MMIH



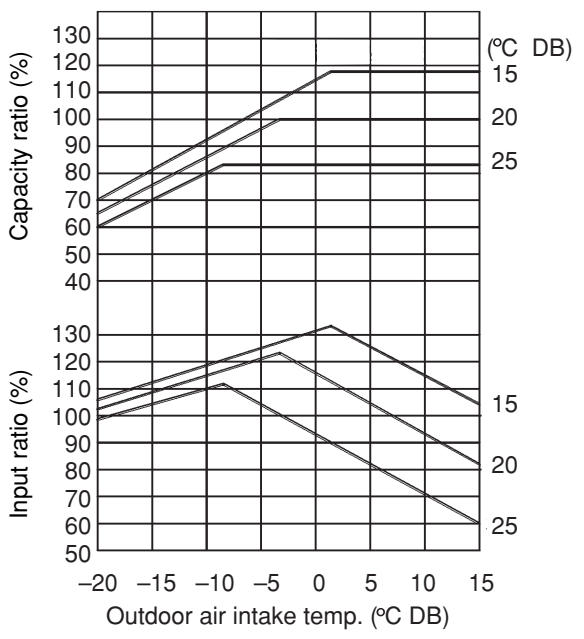
(1) AES 04 MMIH
AES 05 MMIH

(2) AES 06 MMIH

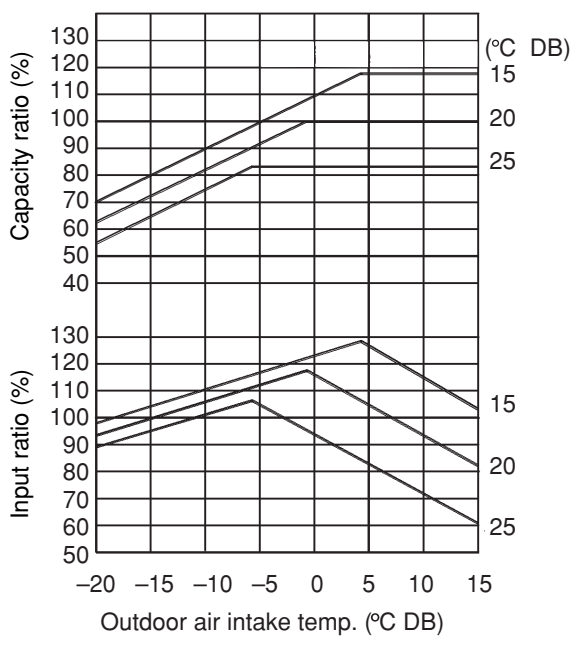
1. Model Selecting and Capacity Calculator

<HEATING>

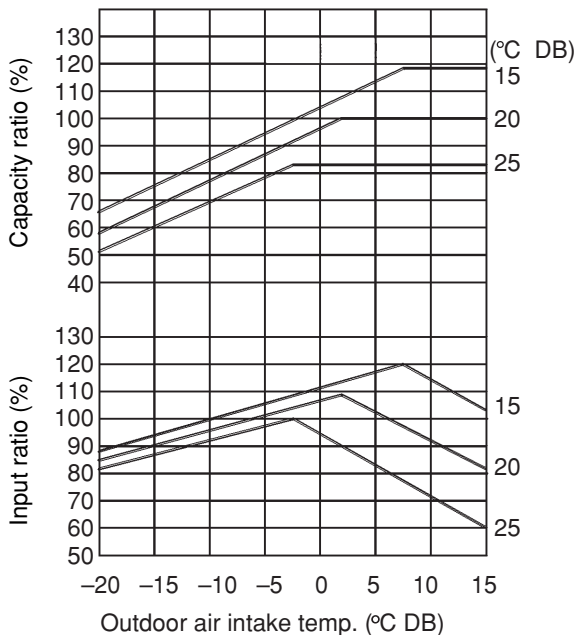
AES 04 MMIH



AES 05 MMIH



AES 06 MMIH



NOTE

For model combinations (inverter model + constant-speed model) of 22 HP or higher, the lower limit for the outdoor air intake temperature is 5°C.
However, when the inverter model (AES------MMIH) is used separately, the lower limit for the outdoor air intake temperature is –5°C.

1. Model Selecting and Capacity Calculator

● **Inverter model rated performance values**

Item / Model (SPW-)	Cooling		Heating	
	Cooling capacity (kW)	Power consumption (kW)	Heating capacity (kW)	Power consumption (kW)
AES 04 MMIH	11.2	2.76	12.5	2.88
AES 05 MMIH	14.0	3.83	16.0	3.90
AES 06 MMIH	15.5	4.57	17.6	4.58

■ **Outdoor unit heating capacity correction coefficient during frosting/defrosting (1 – (3))**

Outdoor intake air temp. (°C WB RH 85%)	–20	–15	–10	–8	–6	–5	–4	–2	–1	0	1	2	3	4	5	6
Correction coefficient	0.97	0.97	0.97	0.96	0.94	0.91	0.89	0.87	0.87	0.87	0.88	0.89	0.91	0.92	0.95	1.0

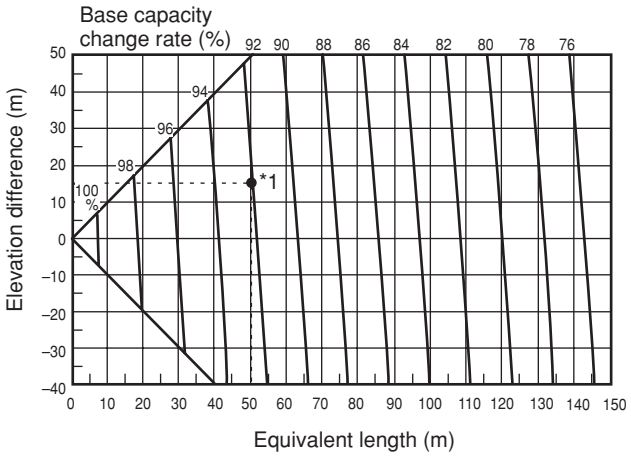
* To calculate the heating capacity with consideration for frosting/defrosting operation, multiply the heating capacity found from the capacity graph by the correction coefficient from the table above.

2

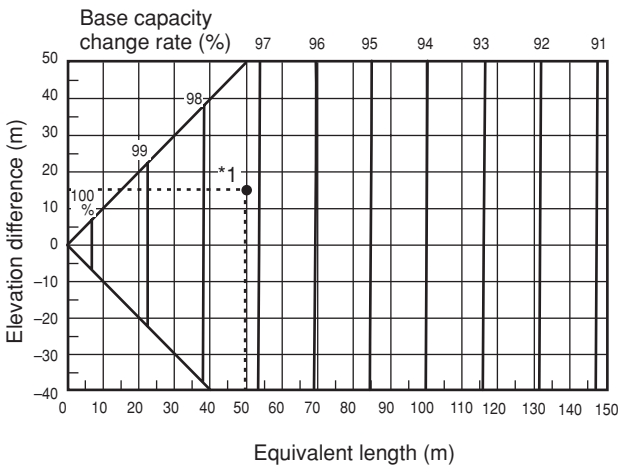
1-5. Capacity Correction Graph According to Tubing Length and Elevation Difference

■ **Capacity change characteristics**

<Cooling>



<Heating>



1. Model Selecting and Capacity Calculator

For CR365, 485GX(H)56 units

■ If the maximum tubing length (L1) exceeds 90 m (equivalent length), increase the tubing size of the main gas tube (LM) by one rank.

* The size increase is applied to the gas tube only. In addition, for a 6 HP unit it is not necessary to increase the tubing size.

■ Increasing the tubing size of the gas tubes can reduce the loss of capacity caused by longer tubing lengths. Refer to Table 1 to increase the tubing size. However, the maximum allowable tubing length must not be exceeded.

* The size increase is applied to the LM gas tube (main tube with the largest diameter) only, and is limited to the cases shown in Table 1. In addition, the amount of additional refrigerant charge is determined from the liquid-tube size only.

* In case of 6PS, increasing the size of the gas tube is not possible.

Table 1 Correction coefficient for equivalent length when the size of the gas tube (LM) is increased

Standard tube diameter (gas tube, mm)	ø15.88
Tube diameter after change (gas tube, mm)	ø19.05
Equivalent length correction coefficient	0.4

* When increasing the size of the gas tubing (LM), multiply by the correction coefficient from Table 1 and calculate the equivalent length for section LM.

Tubing equivalent length after size increase = Standard tubing equivalent length × Equivalent length correction coefficient

WARNING **The upper limit for tubing size is ø19.05. Tubing above that size cannot be used.**

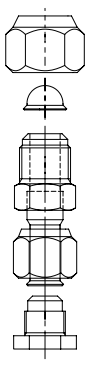
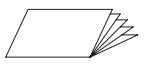
2. System Design

2-1. Tools Required for Installation (not supplied)

1. Standard screwdriver
2. Phillips head screwdriver
3. Knife or wire stripper
4. Tape measure
5. Carpenter's level
6. Sabre saw or key hole saw
7. Hacksaw
8. Core bits
9. Hammer
10. Drill
11. Tube cutter
12. Tube flaring tool
13. Torque wrench
14. Adjustable wrench
15. Reamer (for deburring)

2-2. Accessories Supplied with Outdoor Unit

Table 2-1 (Outdoor Unit)

Part name	Figure	Quantity		
		365 Model (4 hp)	485 Model (5 hp)	605 Model (6 hp)
Tube Discharge Assy		0	0	1
Instruction manual	 paper	1	1	1

hp = horsepower

2-3. Type of Copper Tube and Insulation Material

If you wish to purchase these materials separately from a local source, you will need:

1. Deoxidized annealed copper tube for refrigerant tubing.
2. Foamed polyethylene insulation for copper tubes as required to precise length of tubing. Wall thickness of the insulation should be not less than 8 mm.
3. Use insulated copper wire for field wiring. Wire size varies with the total length of wiring. Refer to **5. ELECTRICAL WIRING** for details.

CAUTION

Check local electrical codes and regulations before obtaining wire. Also, check any specified instructions or limitations.

2-4. Additional Materials Required for Installation

1. Refrigeration (armored) tape
2. Insulated staples or clamps for connecting wire (See your local codes.)
3. Putty
4. Refrigeration tubing lubricant
5. Clamps or saddles to secure refrigerant tubing
6. Scale for weighing

2-5. Tubing Size

Table 2-2 Main Tubing Size (LA)

kW	11.2	14.0	15.5
System horsepower	4	5	6
Gas tubing (mm)	ø15.88		ø19.05
Liquid tubing (mm)	ø9.52		

Unit: mm

Table 2-3 Main Tubing Size After Distribution (LB, LC...)

Total capacity after distribution	Below kW	7.1 (2.5 hp)	11.2 (4 hp)	14.0 (5 hp)	15.5 (6 hp)
	Over kW	–	7.1 (2.5 hp)		
Tubing size	Gas tubing (mm)	ø12.7	ø15.88		ø19.05
	Liquid tubing (mm)	ø9.52	ø9.52		

Unit: mm
hp = horsepower

Note: In case the total capacity of connected indoor units exceeds the total capacity of the outdoor units, select the main tubing size for the total capacity of the outdoor units.

Table 2-4 Indoor Unit Tubing Connection (ℓ_1, ℓ_2··· ℓ_{n-1})

Indoor unit type	22	28	36	45	56	73	106	140	--
Gas tubing (mm)	ø12.7					ø15.88			
Liquid tubing (mm)	ø6.35					ø9.52			

Unit: mm

2-6. Straight Equivalent Length of Joints

Design the tubing system by referring to the following table for the straight equivalent length of joints.

Table 2-5 Straight Equivalent Length of Joints

Gas tubing size (mm)	12.7	15.88	19.05
90° elbow	0.30	0.35	0.42
45° elbow	0.23	0.26	0.32
U-shape tube bend (R60– 100 mm)	0.90	1.05	1.26
Trap bend	2.30	2.80	3.20
Y-branch distribution joint	Equivalent length conversion not needed.		
Ball valve for service	Equivalent length conversion not needed.		

Table 2-6 Required Copper Tubing Dimensions Unit: mm

Material		O				
Copper tubing	Outer diameter	6.35	9.52	12.7	15.88	19.05
	Wall thickness	0.8	0.8	0.8	1.0	1.0

2-7. Additional Refrigerant Charge

Additional refrigerant charge amount is calculated from the liquid tubing total length as follows.

Table 2-7 Amount of Refrigerant Charge Per Meter, According to Liquid Tubing Size

Liquid tubing size	Amount of refrigerant charge/m (g/m)
ø6.35	26
ø9.52	56

Required amount of charge = (Amount of refrigerant charge per meter of each size of liquid tube × its tube length) + (...) + (...)

*Always charge accurately using a scale for weighing.

Table 2-8 Refrigerant Charge Amount at Shipment (for outdoor unit)

Heat pump unit (kg)	AES 04 MMIH	AES 05 MMIH	AES 06 MMIH
	3.5	3.5	3.5
Cooling only unit (kg)	AES 04 MMIH	AES 05 MMIH	AES 06 MMIH
	3.5	3.5	3.5

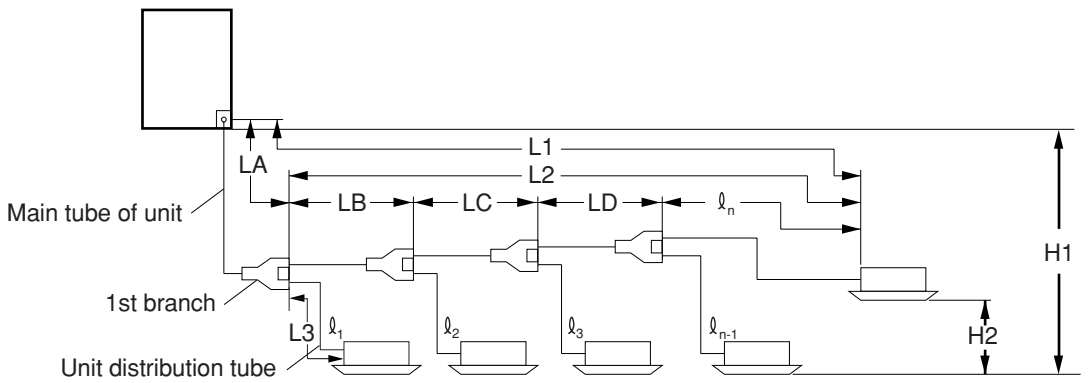
2-8. System Limitations

Table 2-9 System Limitations

Outdoor units (Type)	365	485	605
Number of max. connectable indoor units	6	8	9
Max. allowable indoor/outdoor capacity ratio	50 – 130%		

2-9. Tubing Length

Select the installation location so that the length and size of refrigerant tubing are within the allowable range shown in the figure below.



Note: Do not use commercially available T-joints for the liquid tubing.

* Be sure to use special R410A distribution joints (DDVI: purchased separately) for outdoor unit connections and tubing branches.

R410A distribution joint
DDVI 16 (for indoor unit)

Table 2-10 Ranges that Apply to Refrigerant Tubing Lengths and to Differences in Installation Heights

Items	Marks	Contents		Length (m)
Allowable tubing length	L1	Max. tubing length	Actual length	≤ 150
			Equivalent length	≤ 175
	ΔL (L2 – L3)	Difference between max. length and min. length from the No.1 distribution joint		≤ 40
	ℓ_1, ℓ_2~ ℓ_n	Max. length of each distribution tube		≤ 30
	$\ell_1+\ell_2+\sim\ell_{n-1}+L1$	Total max. tubing length including length of each distribution tube (only liquid tubing)		≤ 200
Allowable elevation difference	H1	When outdoor unit is installed higher than indoor unit		≤ 50
		When outdoor unit is installed lower than indoor unit		≤ 40
	H2	Max. difference between indoor units		≤ 15

L = Length, H = Height

WARNING **Always check the gas density limit for the room in which the unit is installed.**

2-10. Check of Limit Density

When installing an air conditioner in a room, it is necessary to ensure that even if the refrigerant gas accidentally leaks out, its density does not exceed the limit level for that room.

If the density could exceed the limit level, it is necessary to provide an opening between the unit and the adjacent room, or to install mechanical ventilation which is interlocked with the leak detector.

(Total refrigerant charged amount: kg)

(Min. indoor volume where the indoor unit is installed: m³)

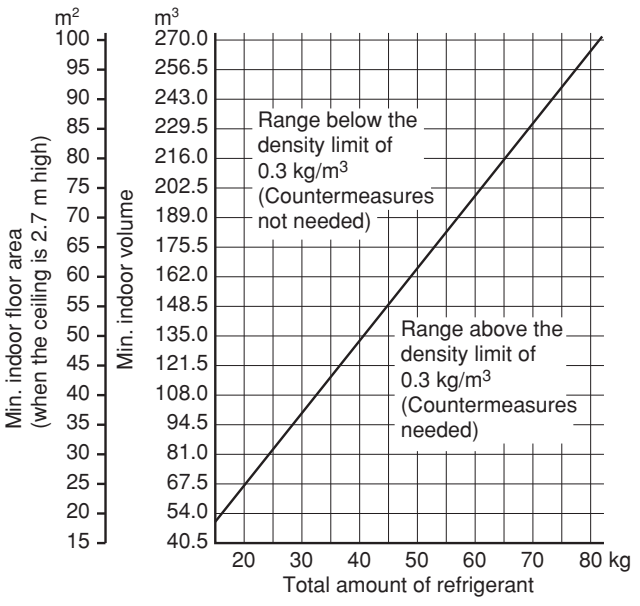
≤ **Limit density 0.3 (kg/m³)**

The limit density of refrigerant which is used in this unit is 0.3 kg/m^3 (ISO 5149).

The shipped outdoor unit comes charged with the amount of refrigerant fixed for each type, so add it to the amount that is charged in the field. (For the refrigerant charge amount at shipment, refer to the unit's nameplate.)

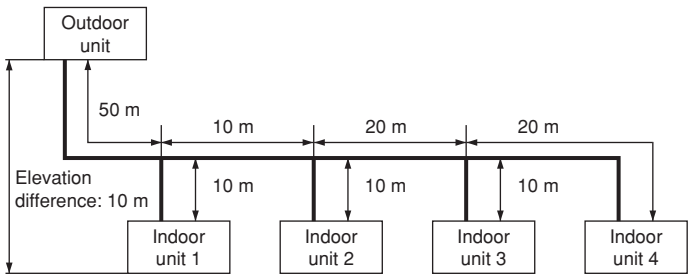
CAUTION **Pay special attention to any location, such as a basement, etc., where leaking refrigerant can accumulate, since refrigerant gas is heavier than air.**

Minimum indoor volume & floor area as against the amount of refrigerant is roughly as given in the following table.



2-11. System Example

(1) Below are the tables created using the “Sanyo PAC/GHP System Diagram Software.” Details of the calculations are shown in (2).



Selection conditions

Assumes that installation is in a 50 Hz region.

		Outdoor unit	Room 1 (indoor unit 1)	Room 2 (indoor unit 2)	Room 3 (indoor unit 3)	Room 4 (indoor unit 4)
Selected model		AES 04 MMIH	Type 56	Type22	Type22	Type 22
Cooling	Air condition (DB/WB)	33.0 / 22.5	26.0 / 18.0	26.0 / 18.0	26.0 / 18.0	26.0 / 18.0
	Max. load (kW)	———	5.4	1.8	2.1	2.1
Heating	Air condition (DB/WB)	3.0 / 2.0	21.0 / 13.0	21.0 / 13.0	21.0 / 13.0	21.0 / 13.0
	Max. load (kW)	———	5.6	2.3	2.3	2.3
Actual tubing length		100 m	60 m	70 m	90 m	100 m
Equivalent length (with consideration for curves,etc.)		120 m	72 m	84 m	108 m	120 m

Preliminary selection

	Outdoor unit	Room 1 (indoor unit 1)	Room 2 (indoor unit 2)	Room 3 (indoor unit 3)	Room 4 (indoor unit 4)
Selected model	AES 05 MMIH	Type 56	Type 22	Type 22	Type 22
Load (cooling/heating) (kW)	———	5.4 / 5.6	1.8 / 2.3	2.1 / 2.3	2.1 / 2.3
Rated capacity (cooling/heating) (kW)	14.0 / 16.0	5.6 / 6.3	2.2 / 2.5	2.2 / 2.5	2.2 / 2.5
(5) Corrected capacity (cooling/heating) (kW)	11.17 / 13.20	5.60 / 5.96	2.20 / 2.35	2.11 / 2.31	2.05 / 2.29
(7) Actual capacity (cooling/heating) (kW)	———	5.32 / 5.96	2.09 / 2.35	2.00 / 2.31	1.95 / 2.29

Total corrected capacity of indoor units (cooling/heating) = 11.96 / 12.91

Ruc = 11.96 / 11.17 = 1.071 > 1 Ruh = 12.91 / 13.20 = 0.978 < 1

Outdoor unit changes

During heating, the corrected outdoor unit capacity is less than the total corrected capacity of all indoor units in the system. As a result, the actual capacity of each indoor unit is less than the maximum load. Therefore the outdoor unit is increased by one rank.

	Outdoor unit	Room 1 (indoor unit 1)	Room 2 (indoor unit 2)	Room 3 (indoor unit 3)	Room 4 (indoor unit 4)
Selected model	AES 06 MMIH	Type 56	Type 22	Type 22	Type 22
Maximum load (cooling/heating) (kW)	———	5.4 / 5.6	1.8 / 2.3	2.1 / 2.3	2.1 / 2.3
Rated capacity (cooling/heating) (kW)	16.0 / 18.0	5.6 / 6.3	2.2 / 2.5	2.2 / 2.5	2.2 / 2.5
(5) Corrected capacity (cooling/heating) (kW)	12.77 / 14.85	5.60 / 5.96	2.20 / 2.35	2.11 / 2.31	2.05 / 2.29
(7) Actual capacity (cooling/heating) (kW)	———	5.60 / 5.96	2.20 / 2.35	2.11 / 2.31	2.05 / 2.29

Total corrected capacity of all indoor units (cooling/heating) = 11.96 / 12.91

Ruc = 11.96 / 12.77 = 0.937 < 1 Ruh = 12.91 / 14.85 = 0.869 < 1

Indoor unit changes

The indoor unit in room 4, where the corrected indoor unit capacity is less than the maximum load, is increased by one rank.

	Outdoor unit	Room 1 (indoor unit 1)	Room 2 (indoor unit 2)	Room 3 (indoor unit 3)	Room 4 (indoor unit 4)
Selected model	AES 06 MMIH	Type 56	Type 22	Type 22	Type 28
Maximum load (cooling/heating) (kW)	———	5.4 / 5.6	1.8 / 2.3	2.1 / 2.3	2.1 / 2.3
Rated capacity (cooling/heating) (kW)	16.0 / 18.0	5.6 / 6.3	2.2 / 2.5	2.2 / 2.5	2.8 / 3.2
(5) Corrected capacity (cooling/heating) (kW)	12.77 / 14.85	5.60 / 5.96	2.20 / 2.35	2.11 / 2.31	2.62 / 2.93
(7) Actual capacity (cooling/heating) (kW)	———	5.60 / 5.96	2.20 / 2.35	2.11 / 2.31	2.62 / 2.93

Total corrected capacity of all indoor units (cooling/heating) = 12.53 / 13.55

Ruc = 12.53 / 12.77 = 0.981 < 1 Ruh = 13.55 / 14.85 = 0.913 < 1

- For both cooling and heating in all rooms, actual capacity is now greater than or equal to the maximum load. Selection is completed.

(2) Calculate the final selection results according to the capacity calculation procedure.

[From calculation of the correction coefficient to calculation of actual capacity] (Cooling/heating)

		Outdoor unit	Room 1 (indoor unit 1)	Room 2 (indoor unit 2)	Room 3 (indoor unit 3)	Room 4 (indoor unit 4)
Rated capacity (cooling/heating) (kW)		16.0 / 18.0	5.6 / 6.3	2.2 / 2.5	2.2 / 2.5	2.8 / 3.2
Correction coefficient	(1) Model	1.00 / 1.00	———	———	———	———
	(2) Temp. condition	1.00 / 1.00	0.934 / 0.917	0.934 / 0.917	0.934 / 0.917	0.934 / 0.917
	(3) Tubing length, elevation difference	0.798 / 0.927	0.882 / 0.956	0.861 / 0.950	0.819 / 0.934	0.798 / 0.927
	Distribution ratio	———	0.944 / 1.198	0.922 / 1.190	0.877 / 1.170	1.000 / 1.000
	(4) Frosting • defrosting	— / 0.89	———	———	———	———
Result of (2) × (3)		———	1.032 / 0.964	1.008 / 0.940	0.959 / 0.924	0.934 / 0.917
Correction coefficient applied to indoor unit *1		———	1.000 / 0.946	1.000 / 0.940	0.959 / 0.924	0.934 / 0.917
(5) Corrected capacity (kW) *2		12.77 / 14.85	5.60 / 5.96	2.20 / 2.35	2.11 / 2.31	2.62 / 2.93
(6) Correction coefficient for corrected capacity ratio		———	1.00 / 1.00	———	———	———
(7) Actual capacity (kW)		———	5.60 / 5.96	2.20 / 2.35	2.11 / 2.31	2.62 / 2.93

*1: This varies depending on the values of (2) and (2) × (Distribution ratio in (3)).

*2: Corrected outdoor unit capacity = Rated outdoor unit capacity × (1) × (2) × (3) × (4)

The actual capacity is calculated as shown below.

Cooling: Ruc = (5.60 + 2.20 + 2.11 + 2.62) / 12.77 = 0.981 < 1

Therefore,

Actual cooling capacity of each indoor unit = Corrected cooling capacity of each indoor unit

(In other words, the correction coefficient [6] for the corrected capacity ratio is 1.)

Heating: Ruh = (5.96 + 2.35 + 2.31 + 2.93) / 14.85 = 0.913 < 1

Therefore,

Actual heating capacity of each indoor unit = Corrected heating capacity of each indoor unit

(In other words, the correction coefficient (6) for the corrected capacity ratio is 1.)

2-12. Example of Tubing Size Selection and Refrigerant Charge Amount

Additional refrigerant charging

Based on the values in Tables 2-2, 2-3, 2-4 and 2-7, use the liquid tubing size and length, and calculate the amount of additional refrigerant charge using the formula below.

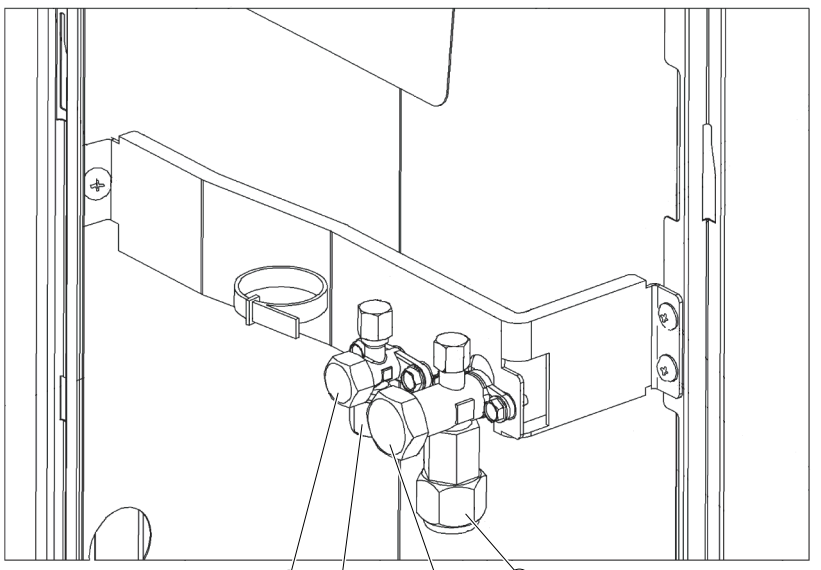
$$\boxed{\text{Required additional refrigerant charge (kg)}} = [56 \times (a) + 26 \times (b)] \times 10^{-3}$$

(a): Liquid tubing Total length of ø9.52 (m) (b): Liquid tubing Total length of ø6.35 (m)

- Charging procedure

  Be sure to charge with R410A refrigerant **in liquid form**.

  1. After performing a vacuum, charge with refrigerant from the liquid tubing side. At this time, all valves must be in the “fully closed” position.
  2. If it was not possible to charge the designated amount, operate the system in Cooling mode while charging with refrigerant from the gas tubing side. (This is performed at the time of the test run. For this, all valves must be in the “fully open” position.)
     Charge with R410A refrigerant in liquid form.
     With R410A refrigerant, charge while adjusting the amount being fed a little at a time in order to prevent liquid refrigerant from backing up.
- After charging is completed, turn all valves to the “fully open” position.
- Replace the tubing covers as they were before.

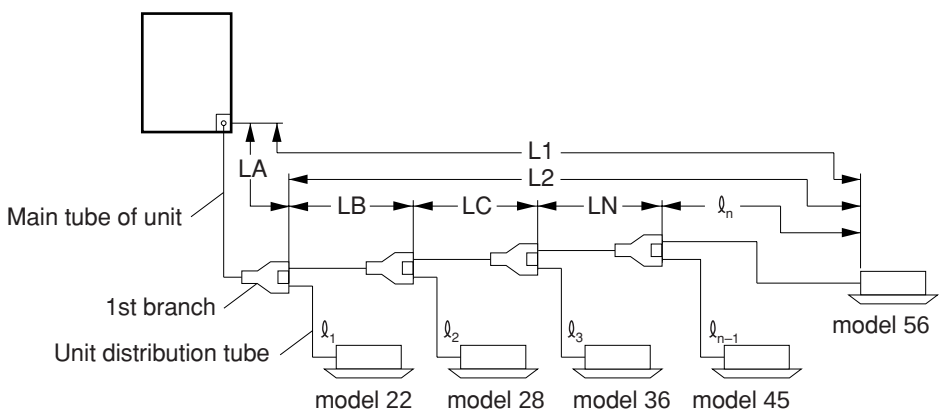

Tightening torque for valve stem cap: 19~21 N·m ④
① Tightening torque: 68~82 N·m
Tightening torque: 34~42 N·m ③
② Tightening torque for valve stem cap: 28~32 N·m

CAUTION

1. **R410A additional charging absolutely must be done through liquid charging.**
2. **The R410A refrigerant cylinder has a gray base color, and the top part is pink.**
3. **The R410A refrigerant cylinder includes a siphon tube. Check that the siphon tube is present. (This is indicated on the label at the top of the cylinder.)**
4. **Due to differences in the refrigerant, pressure, and refrigerant oil involved in installation, it is not possible in some cases to use the same tools for R22 and for R410A.**

2. System Design

Example:



- Example of each tubing length

Main tubing	**Distribution joint tubing**	
LA = 40 m	Indoor side	
LB = 5 m	ℓ1 = 5 m	ℓ4 = 6 m
LC = 5 m	ℓ2 = 5 m	ℓ5 = 5 m
LD = 15 m	ℓ3 = 2 m	

- Obtain charge amount for each tubing size
  Note that the charge amounts per 1 meter are different for each liquid tubing size.

ø9.52 →	LA + LB + LC + LD	: 65 m × 0.056 kg/m	= 3.64 kg
ø6.35 →	ℓ1 + ℓ2 + ℓ3 + ℓ4 + ℓ5	: 23 m × 0.026 kg/m	= 0.598 kg
		Total	4.238 kg

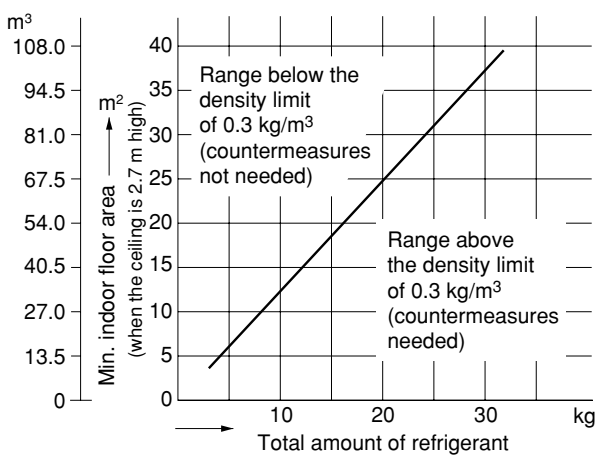
Additional refrigerant charge amount is 4.238 kg.

CAUTION

Be sure to check the limit density for the room in which the indoor unit is installed.

Checking of limit density

Density limit is determined on the basis of the size of a room using an indoor unit of minimum capacity. For instance, when an indoor unit is used in a room (floor area 7.43 m² × ceiling height 2.7 m = room volume 20.06 m³), the graph at right shows that the minimum room volume should be 14.1 m³ (floor area 5.2 m²) for refrigerant of 4.238 kg. Accordingly, openings such as louvers are required for this room.



<Determination by calculation>

Overall refrigerant charge amount for the air conditioner: kg

(Minimum room volume for indoor unit: m³)

$$= \frac{\textbf{4.238 (kg) + 3.5 (kg)}}{\textbf{20.06 (m}^3\textbf{)}} = \textbf{0.39 (kg/m}^3\textbf{)} \geq \textbf{0.3 (kg/m}^3\textbf{)}$$

Therefore, openings such as louvers are required for this room.

2. System Design

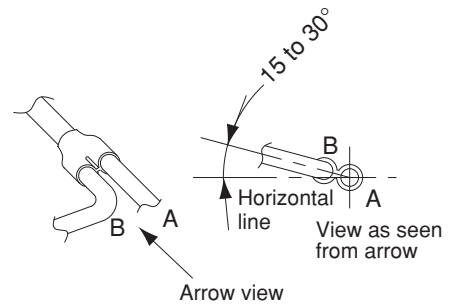
2-13. Installing Distribution Joint

(1) Refer to “HOW TO ATTACH DISTRIBUTION JOINT” enclosed with the optional distribution joint kit (DDVI 16).

(2) In order to prevent accumulation of refrigerant oil in stopped units, if the main tubing is horizontal then each branch tubing length should be at an angle that is greater than horizontal. If the main tubing is vertical, provide a raised starting portion for each branch.

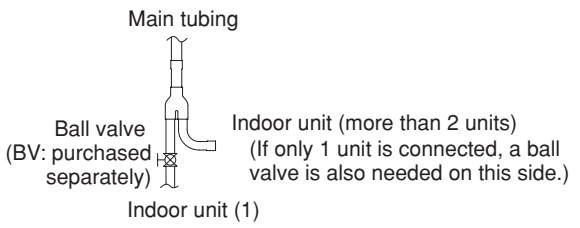
(3) If there are height differences between indoor units or if branch tubing that follows a distribution joint is connected to only 1 unit, a trap or ball valve must be added to that distribution joint. (When adding the ball valve, locate it within 40 cm of the distribution joint.)
(Consult with ARGO separately concerning the ball valve.)
If a trap or ball valve is not added, do not operate the system before repairs to a malfunctioning unit are completed. (The refrigerant oil sent through the tubing to the malfunctioning unit will accumulate and may damage the compressor.)

Tube branching methods (horizontal use)

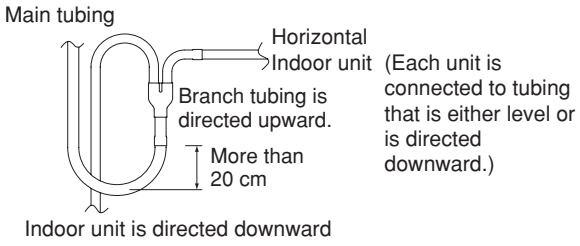


Types of vertical trap specifications

(When using ball valve)


Main tubing
Ball valve (BV: purchased separately)
Indoor unit (more than 2 units)
(If only 1 unit is connected, a ball valve is also needed on this side.)
Indoor unit (1)

(When not using ball valve)


Main tubing
Horizontal
Indoor unit
(Each unit is connected to tubing that is either level or is directed downward.)
Branch tubing is directed upward.
More than 20 cm
Indoor unit is directed downward

2-14. Optional Distribution Joint Kit

See the installation instructions packaged with the distribution joint kit for the installation procedure.

Table 2-11

Model name	Cooling capacity after distribution	Remarks
DDVI 16	22.4 kW or less	For indoor unit

DDVI 16

Use: For indoor unit (Capacity after distribution joint is 22.4 kW or less.)

Example: (F below indicates inner diameter. Ⓕ below indicates outer diameter.)

• When creating a tube of diameter G, use a tube cutter and cut between Ⓕ and H. Cut at a point as close to H as possible.

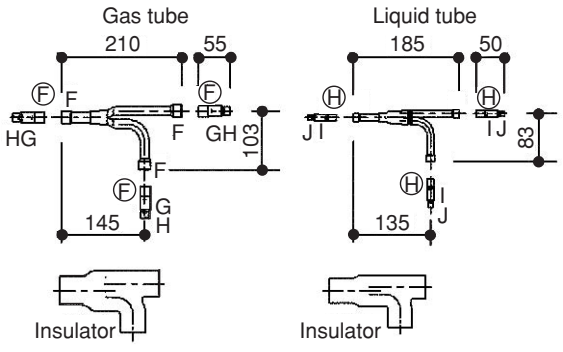


Table 2-12 Dimension for Connections of Each Part

Unit: mm

Position	A	B	C	D	E	F	G	H	I	J
Dimension	–	–	–	–	–	ø19.05	ø15.88	ø12.7	ø9.52	ø6.35

2-15. Optional Ball Valve Kit (N.A.)

Table 2-13

Model No.	Valve connecting tube size (mm)		Indoor unit where used
	Gas tube	Liquid tube	Total capacity of indoor units after the valve
BV-RXP160AG	15.88	9.52	16.0 kW or less
BV-RXP56AG	12.7	6.35	5.6 kW or less

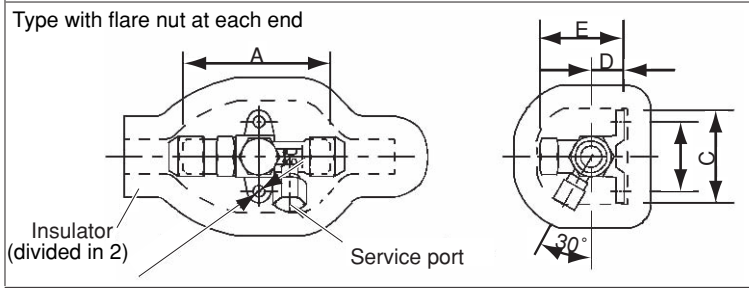
NOTE

1. Because the diameter of this ball valve is approximately the same as the inner diameter of the connecting copper tube, correction for pressure loss is not necessary.
2. Airtightness must be 3.6 MPa or more.
   It is recommended that the ball valve is installed at each outdoor unit (gas tube and liquid tube), in order to prevent refrigerant from being released into the atmosphere if the outdoor unit is eventually replaced.

2. System Design

Dimensions

Unit: mm

Figure	Size \ Dimensions	A	B	C	D	E
Type with flare nut at each end 	ø6.35 (1/4")	72	42	54	16	44
	ø9.52 (3/8")	76	42	54	16	44
	ø12.7 (1/2")	89	42	58	20	51
	ø15.88 (5/8")	108	51	68	22	56

Note: Install the service port so that it faces the extension side.

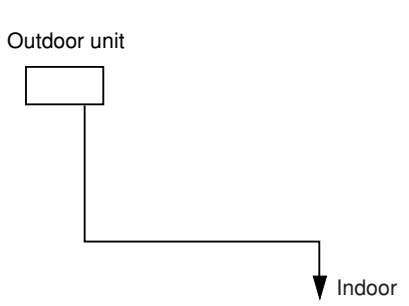
Ball Valve Installation (for refrigerant R410A only)

Check the size of the ball valve set you separately purchased.

Model name	Size
BV-RXP56AG	ø6.35 • ø12.7
BV-RXP160AG	ø9.52 • ø15.88

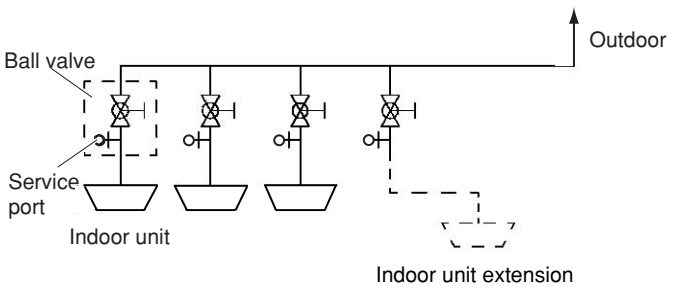
1. Installing the ball valve

(1) If the ball valve is to be installed for indoor unit extension, or near an indoor unit, install it so that the service port faces the indoor unit side.
(This facilitates indoor unit leak testing and vacuum procedures.)
Install the ball valve as close as possible to the distribution joint.



CAUTION

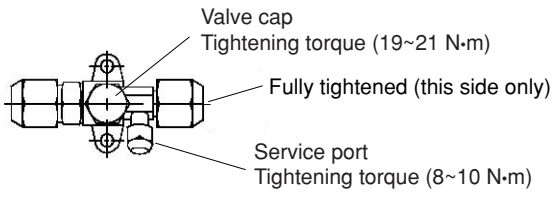
This ball valve is for use only in systems that utilize refrigerant R410A. The service port connection size is ø7.94. The face-to-face distance between the ø12.7 or ø15.88 flare nuts is 26 mm or 29 mm, respectively. Be sure to use only the supplied flare nuts. Be careful to use the correct tools and materials.



2. Flare nut tightening

The flare nut on the service port side is fully tightened. Recommended tightening torque is (8~10 N·m).

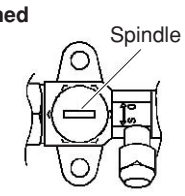
If the valve is used for extension, it can be used as-is. In all other cases, use 2 monkey wrenches in combination to loosen the flare nut.



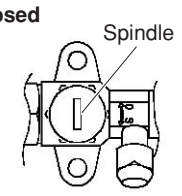
3. Opening and closing the valve

This valve is open at the time of shipment from the factory. If the valve is used for extension, be sure to close it.

Valve opened

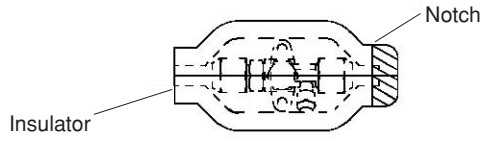


Valve closed



4. Installing thermal insulation

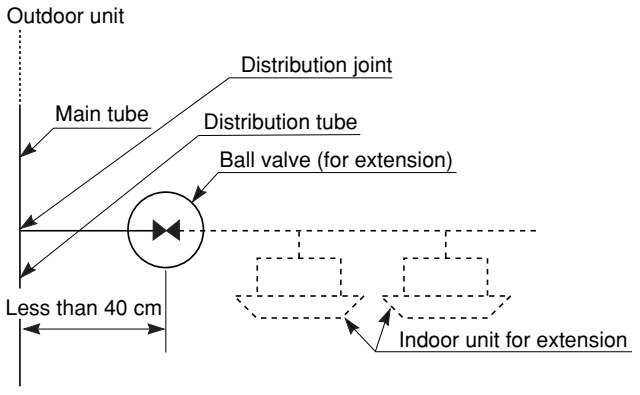
The thermal insulation used for a flare-nut type valve is in the form of a bag. When the valve is used for extension, it can be used as-is. If the valve is used for any other purpose, use a box cutter or similar tool to cut away the part shown in the figure at right.
The insulation is divided into 2 parts. After performing the leak test, use vinyl tape or other means to temporarily fasten the 2 parts together. Then carry out final finishing.

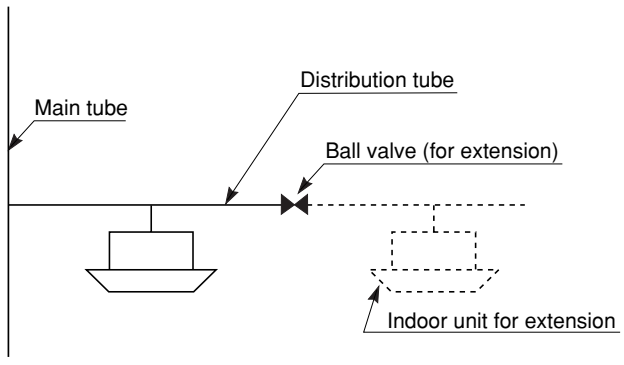


2-14. Recommended Location of Ball Valves

- Select a valve location that allows service to be easily provided for each unit or each refrigerant system.

(1) When adding ball valve for indoor unit





1. Location: Install the ball valve at the distribution tube (not main tube).
2. Installation requirements

- Be sure to install the ball valve up-grade to prevent the inadvertent flow of oil.
- Install the ball valve at the shortest distance (within 40 cm) from the main tube. If the diameter of the ball valve is smaller than that of the main tube, use a reducer or the like to reduce the size of the tubing at that location.
- Select a place where it is easy to operate, using careful consideration of the location in advance.

3. Installation Instructions

3-2. Outdoor Unit

AVOID:

- heat sources, exhaust fans, etc. (Fig. 2-6)
- damp, humid or uneven locations

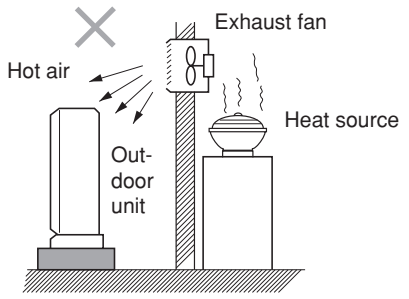


Fig. 2-6

DO:

- choose a place as cool as possible.
- choose a place that is well ventilated and outside air temperature does not exceed maximum 45°C constantly.
- allow enough room around the unit for air intake/ exhaust and possible maintenance. (Fig. 2-7)
- use lug bolts or equal to bolt down unit, reducing vibration and noise.

Installation space

Distance between obstructions and the unit air inlet and outlet must be as shown below.

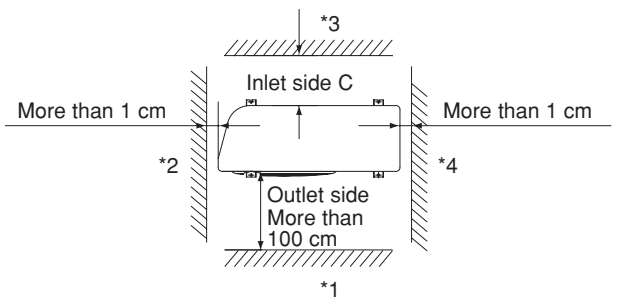


Fig. 2-7

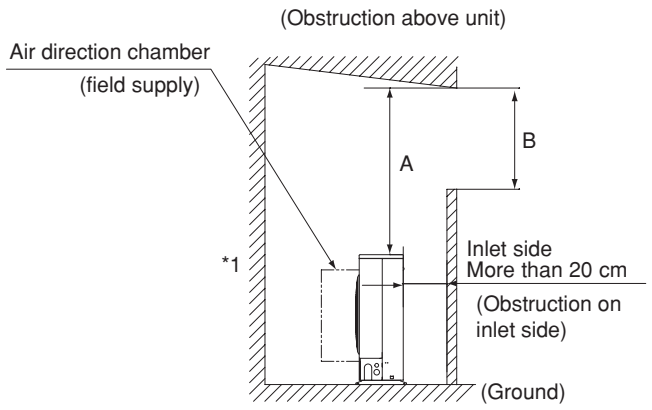


Fig. 2-8

CAUTION

- Concerning inlet-side distance “C” (Fig. 2-7)
  The minimum for distance “C” is 15 cm if there are no obstructions on the outlet side (wall *1 side) and *2 or *4 is not present. In all other cases, the minimum for distance “C” is 20 cm.
- If the unit is installed with the outlet side facing wall *1, then there must be no obstructions on 2 of the remaining 3 sides: *2, *3, *4.
- If wall *1 is on the outlet side (Fig. 2-7), or if obstructions are present on all 3 sides *2, *3, and *4 (Fig. 2-7), then the minimum distance for “A” and “B” is 2 m (Fig. 2-9). Even if there is no wall on the outlet side, a minimum of 100 cm is required.

In case of multiple installations

- provide a solid base (concrete block, 10 × 40 cm beams or equal), a minimum of 15 cm above ground level to reduce humidity and protect the unit against possible water damage and decreased service life. (Fig. 2-9)
- use lug bolts or equal to bolt down unit, reducing vibration and noise.

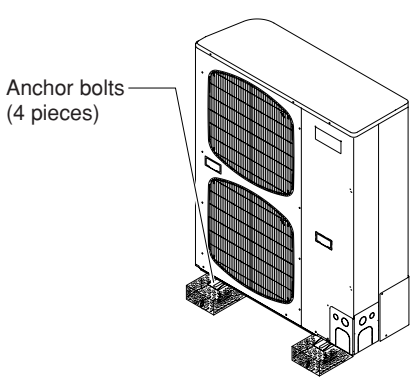


Fig. 2-9

3. Installation Instructions

3-3. Air Discharge Chamber for Top Discharge

Be sure to install an air discharge chamber in the field when:

- it is difficult to keep a space of min. 50 cm between the air discharge outlet and an obstacle.
- the air discharge outlet is facing a sidewalk and discharged hot air may annoy passers-by. Refer to Fig. 2-10.

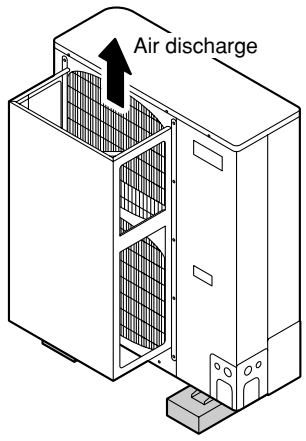


Fig. 2-10

3-4. Installing the Unit in Heavy Snow Areas

In locations with strong wind, snow-proof ducting should be fitted and direct exposure to the wind should be avoided as much as possible.

■ Countermeasures against snow and wind

In regions with snow and strong wind, the following problems may occur when the outdoor unit is not provided with a platform and snow-proof ducting:

a) The outdoor fan may not run and damage to the unit may occur.
b) There may be no air flow.
c) The tubing may freeze and burst.
d) The condenser pressure may drop because of strong wind, and the indoor unit may freeze.

3-5. Precautions for Installation in Heavy Snow Areas

(1) The platform should be higher than the max. snow depth. (Fig. 2-11)
(2) The 2 anchoring feet of the outdoor unit should be used for the platform, and the platform should be installed beneath the air intake side of outdoor unit.
(3) The platform foundation must be firm and the unit must be secured with anchor bolts.
(4) In case of installation on a roof subject to strong wind, countermeasures must be taken to prevent the unit from being blown over.

In regions with significant snowfall, the outdoor unit should be provided with a platform and snow-proof duct.

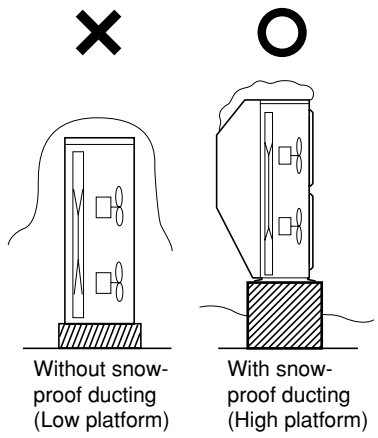


Fig. 2-11

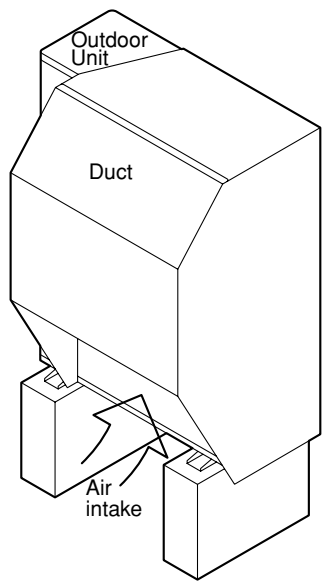


Fig. 2-12

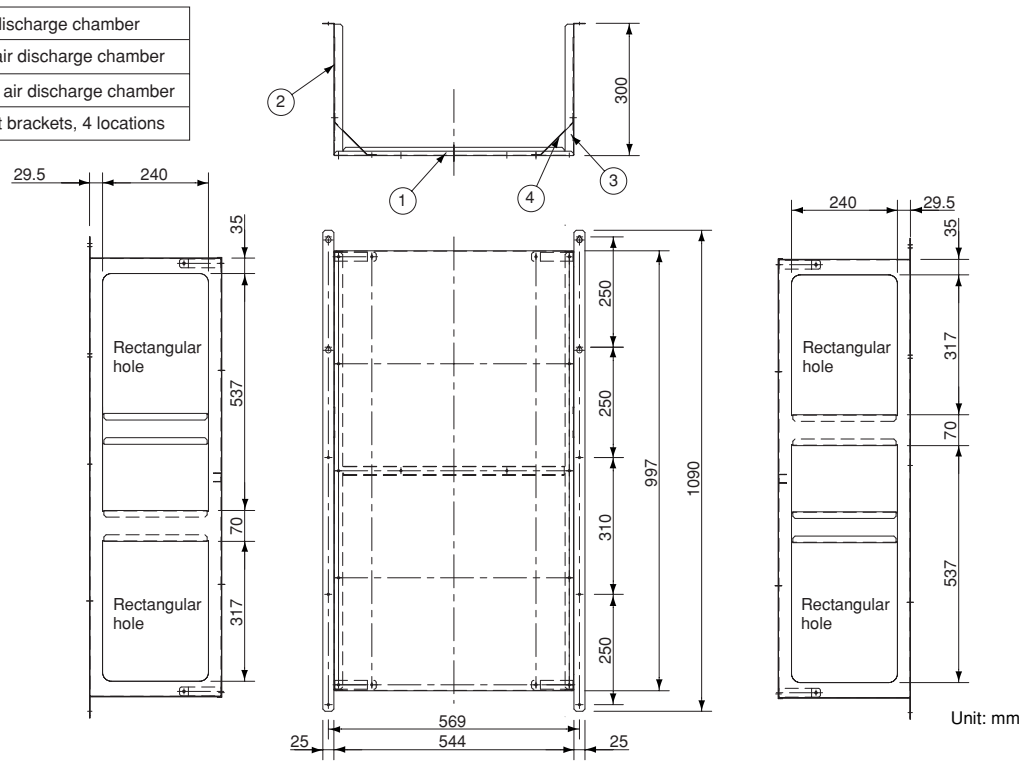
3. Installation Instructions

3-6. Dimensions of Air-Discharge Chamber

Reference diagram for air-discharge chamber (field supply)

*****A for AES 04-05-06 MMIH**

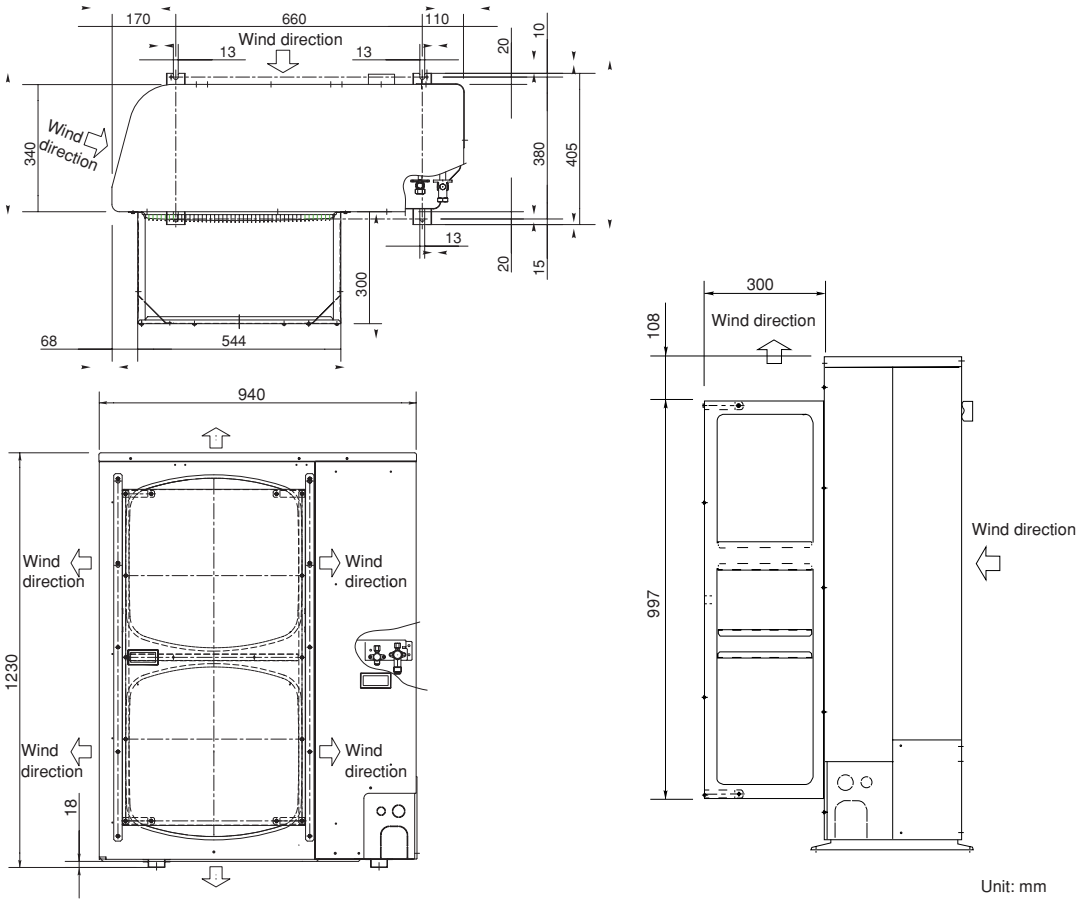
①	Unit front, air discharge chamber
②	Unit left side, air discharge chamber
③	Unit light side, air discharge chamber
④	Reinforcement brackets, 4 locations



Unit: mm

3-7. Dimensions of Outdoor Unit with Air-Discharge Chamber (field supply)

AES 04-05-06 MMIH with ***



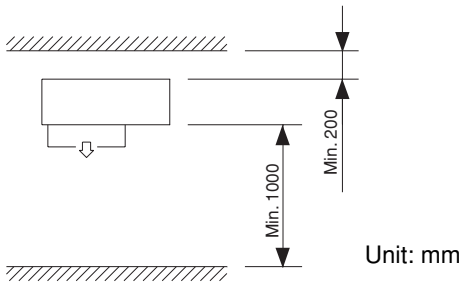
Unit: mm

3. Installation Instructions

Reference for air-discharge chamber (field supply)
Required space around outdoor unit
AES 04-05-06 MMIH) with ***

If an air discharge chamber is used, the space shown below must be secured around the outdoor unit.
If the unit is used without the required space, a protective device may activate, preventing the unit from operating.

(1) Single-unit installation



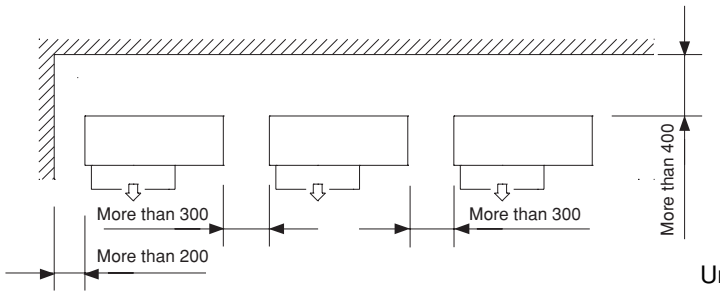
Unit: mm

CAUTION

The top and both sides must remain open.
If there are obstacles to the front and rear of the outdoor unit, the obstacle at either the front or rear must be no taller than the height of the outdoor unit.

(2) Multiple-unit installation

● Installation in lateral rows (side-by-side)



Unit: mm

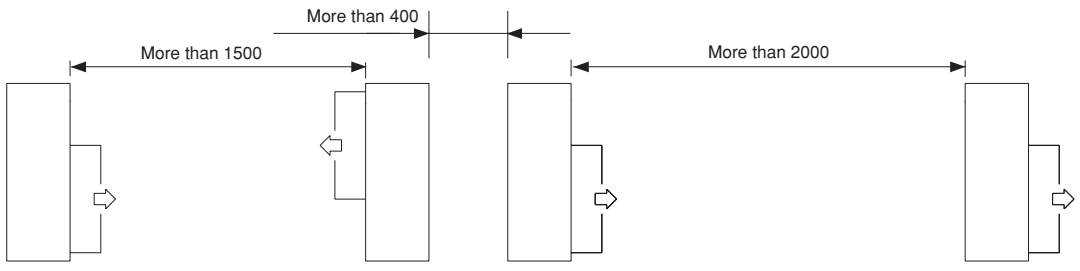
CAUTION

The front and top must remain open.
The obstacles must be no taller than the height of the outdoor unit.

● Installation in front-rear rows

Installation with intakes facing intakes or outlets facing outlets

Installation with intakes facing outlets



Unit: mm

CAUTION

The front and both sides must remain open.

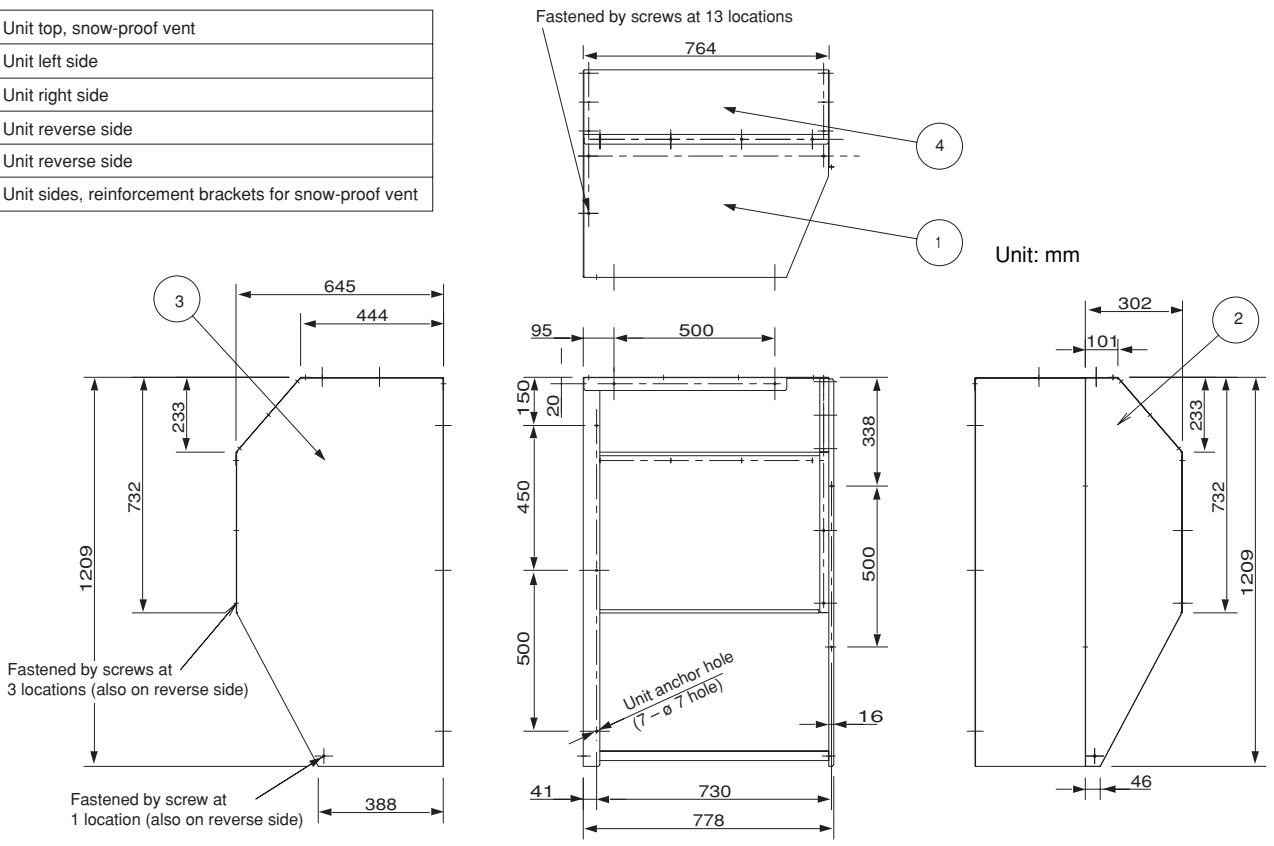
3. Installation Instructions

3-8. Dimensions of Snow Ducting

Reference diagram for snow-proof vents (field supply)

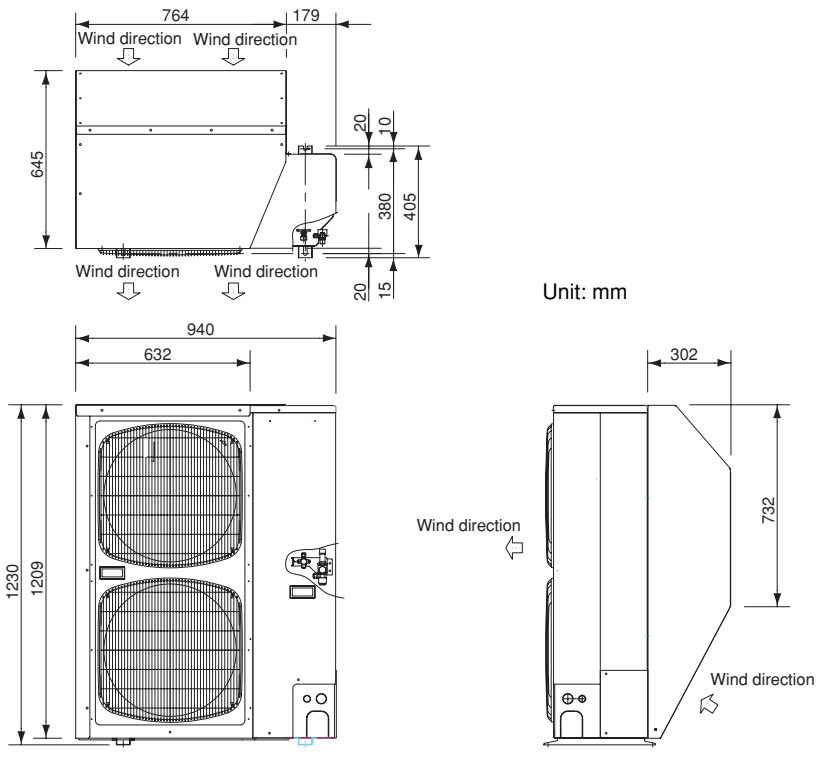
***** for AES 04-05-06 MMIH**

①	Unit top, snow-proof vent
②	Unit left side
③	Unit right side
④	Unit reverse side
⑤	Unit reverse side
⑥	Unit sides, reinforcement brackets for snow-proof vent



3-9. Dimensions of Outdoor Unit with Snow-Proof Vents (field supply)

AES 04-05-06 MMIH with ***



3. Installation Instructions

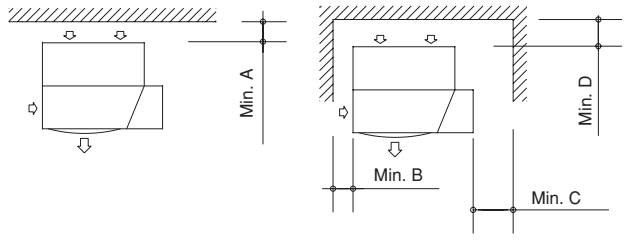
Reference diagram for snow-proof vents – 1

Space requirements for setting – (1)
AES 04-05-06 MMIH with *

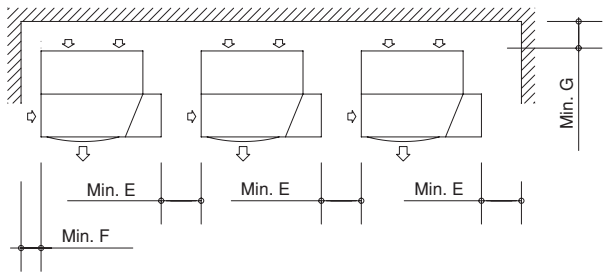
[Obstacle to the rear of unit]

● Top is open:

(1) Single-unit installation (2) Obstacles on both sides



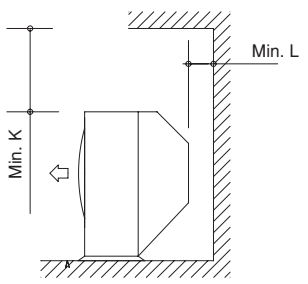
(3) Multiple-unit installation (2 or more units)



Outdoor unit	A	B	C	D	E	F	G
AES 04-05-06 MMIH	150	150	300	200	300	150	200

Note: In cases 2 and 3 the height of the obstacle must be no taller than the height of the outdoor unit.

● Top is blocked by an obstacle:

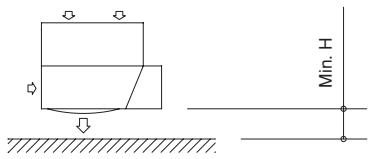


Outdoor unit	K	L
AES 04-05-06 MMIH 500 150		

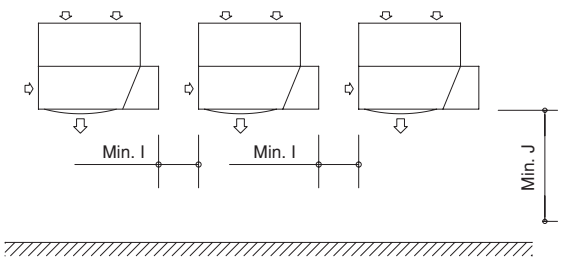
[Obstacle to the front of unit]

● Top is open:

(1) Single-unit installation

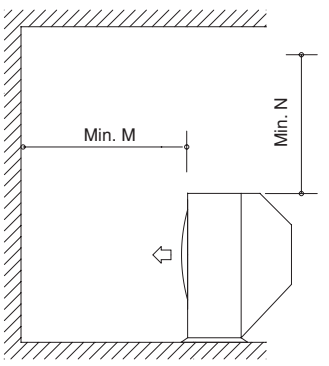


(2) Multiple-unit installation (2 or more units)



Outdoor unit	H	I	J
AES 04-05-06 MMIH	500	300	1000

● Top is blocked by an obstacle:



Outdoor unit	M	N
AES 04-05-06 MMIH 1000 1000		

Unit: mm

3. Installation Instructions

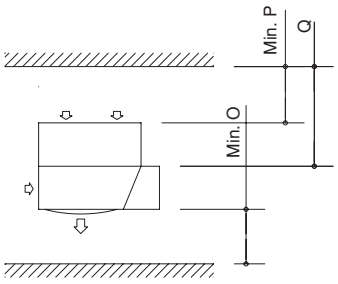
Reference diagram for snow-proof vents – 2

Space requirements for setting – (2)
AES 04-05-06 MMIH with *

[Obstacles to the front and rear of unit]

- The top and both sides must remain open. Either the obstacle to the front or the obstacle to the rear must be no taller than the height of the outdoor unit.

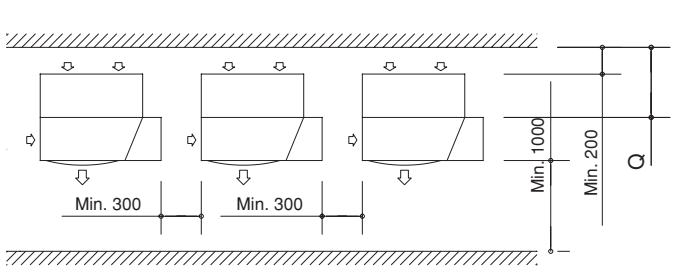
(1) Single-unit installation



Dimension Q
If a snow protection duct is attached after the unit is installed, verify that dimension Q is 500 mm or more.

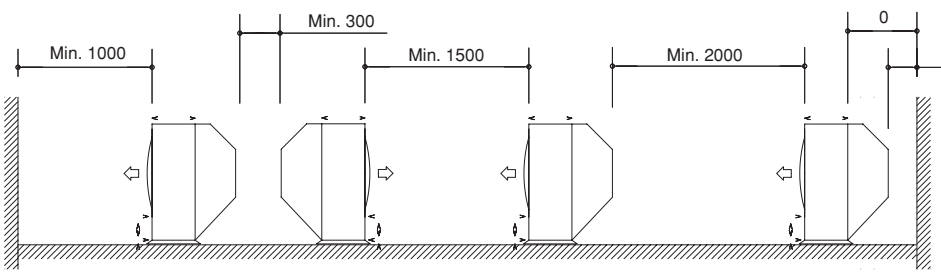
Outdoor unit	O	P
AES 04-05-06 MMIH	1000	150

(2) Obstacles on both sides



[Installation in front-rear rows]

- The top and both sides must remain open. Either the obstacle to the front or the obstacle to the rear must be no taller than the height of the outdoor unit.



Dimension Q
If a snow protection duct is attached after the unit is installed, verify that dimension Q is 500 mm or more.

Unit: mm

3. Installation Instructions

3-10. Installing the Outdoor Unit

- Use concrete or a similar material to create the base, and ensure good drainage.
- Ordinarily, ensure a base height of 5 cm or more. If a drain pipe is used, or for use in cold-weather regions, ensure a height of 15 cm or more at the feet on both sides of the unit.
  (In this case, leave clearance below the unit for the drain pipe, and to prevent freezing of drainage water in cold-weather regions.)
- Refer to the Fig. 3-1 for the anchor bolt dimensions.
- Be sure to anchor the feet with the anchor bolts (M10). In addition, use anchoring washers on the top side. (Use large square 32 × 32 SUS washers with JIS nominal diameters of 10.) (Field supply)

3-11. Drainage Work

Follow the procedure below to ensure adequate draining for the outdoor unit.

- For the drain port dimensions, refer to the figure at right.
- Ensure a base height of 15 cm or more at the feet on both sides of the unit.
- When using a drain pipe, install the drain socket (optional part STK-DS25T) onto the drain port. Seal the other drain port with the rubber cap supplied with the drain socket.
- For details, refer to the instruction manual of the drain socket (optional part ***).

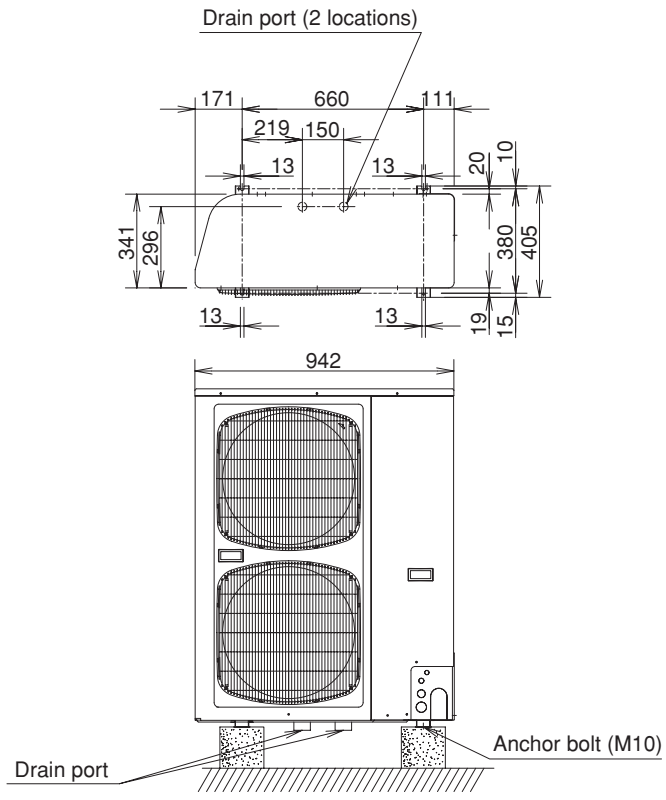


Fig. 3-1

3-12. Routing the Tubing and Wiring

- The tubing and wiring can be extended out in 4 directions: front, rear, right, and down.
- The service valves are housed inside the unit. To access them, remove the inspection panel. (To remove the inspection panel, remove the 3 screws, then slide the panel downward and pull it toward you.)

(1) If the routing direction is through the front, rear, or right, use a nipper or similar tool to cut out the knockout holes for the inter-unit control wiring outlet, power wiring outlet, and tubing outlet from the appropriate covers A and B.

(2) If the routing direction is down, use a nipper or similar tool to cut out the lower flange from cover A.

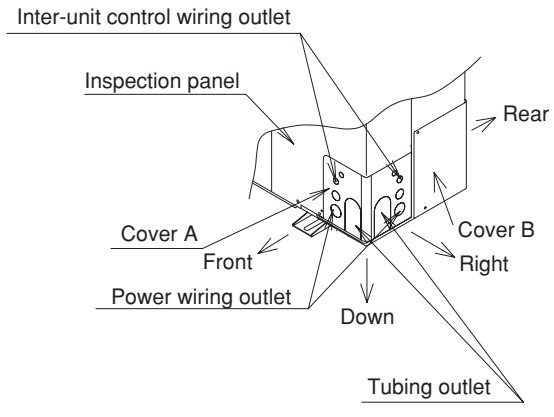


Fig. 3-2

CAUTION

- **Route the tubing so that it does not contact the compressor, panel, or other parts inside the unit. Increased noise will result if the tubing contacts these parts.**
- **When routing the tubing, use a tube bender to bend the tubes.**

4. Electrical Wiring

4-1. General Precautions on Wiring

(1) Before wiring, confirm the rated voltage of the unit as shown on its nameplate, then carry out the wiring closely following the wiring diagram.

(2) Provide a power outlet to be used exclusively for each unit, and a power supply disconnect and circuit breaker for overcurrent protection should be provided in the exclusive line.

(3) To prevent possible hazards from insulation failure, the unit must be grounded.

(4) Each wiring connection must be done in accordance with the wiring system diagram. Wrong wiring may cause the unit to misoperate or become damaged.

(5) Do not allow wiring to touch the refrigerant tubing, compressor, or any moving parts of the fan.

(6) Unauthorized changes in the internal wiring can be very dangerous. The manufacturer will accept no responsibility for any damage or misoperation that occurs as a result of such unauthorized changes.

(7) Regulations on wire diameters differ from locality to locality. For field wiring rules, please refer to your LOCAL ELECTRICAL CODES before beginning.

You must ensure that installation complies with all relevant rules and regulations.

(8) To prevent malfunction of the air conditioner caused by electrical noise, care must be taken when wiring as follows:

- The remote control wiring and the inter-unit control wiring should be wired apart from the inter-unit power wiring.
- Use shielded wires for inter-unit control wiring between units and ground the shield on both sides.

(9) If the power supply cord of this appliance is damaged, it must be replaced by a repair shop appointed by the manufacturer, because special purpose tools are required.

4-2. Recommended Wire Length and Wire Diameter for Power Supply System

Outdoor unit

	(A) Power supply		Time delay fuse or circuit capacity
	Wire size	Max. length	
AES 04 MMIH	4 mm^2	16 m	25 A
AES 05 MMIH	6 mm^2	24 m	35 A
AES 06 MMIH	6 mm^2	20 m	35 A

Indoor unit

Type	(B) Power supply	Time delay fuse or circuit capacity
	2.5 mm^2	
AWS	Max. 150 m	10 ~ 16A
ASS-ACS-FC-SD	Max. 130 m	10 ~ 16A
ADS	Max. 60 m	10 ~ 16A

Control wiring

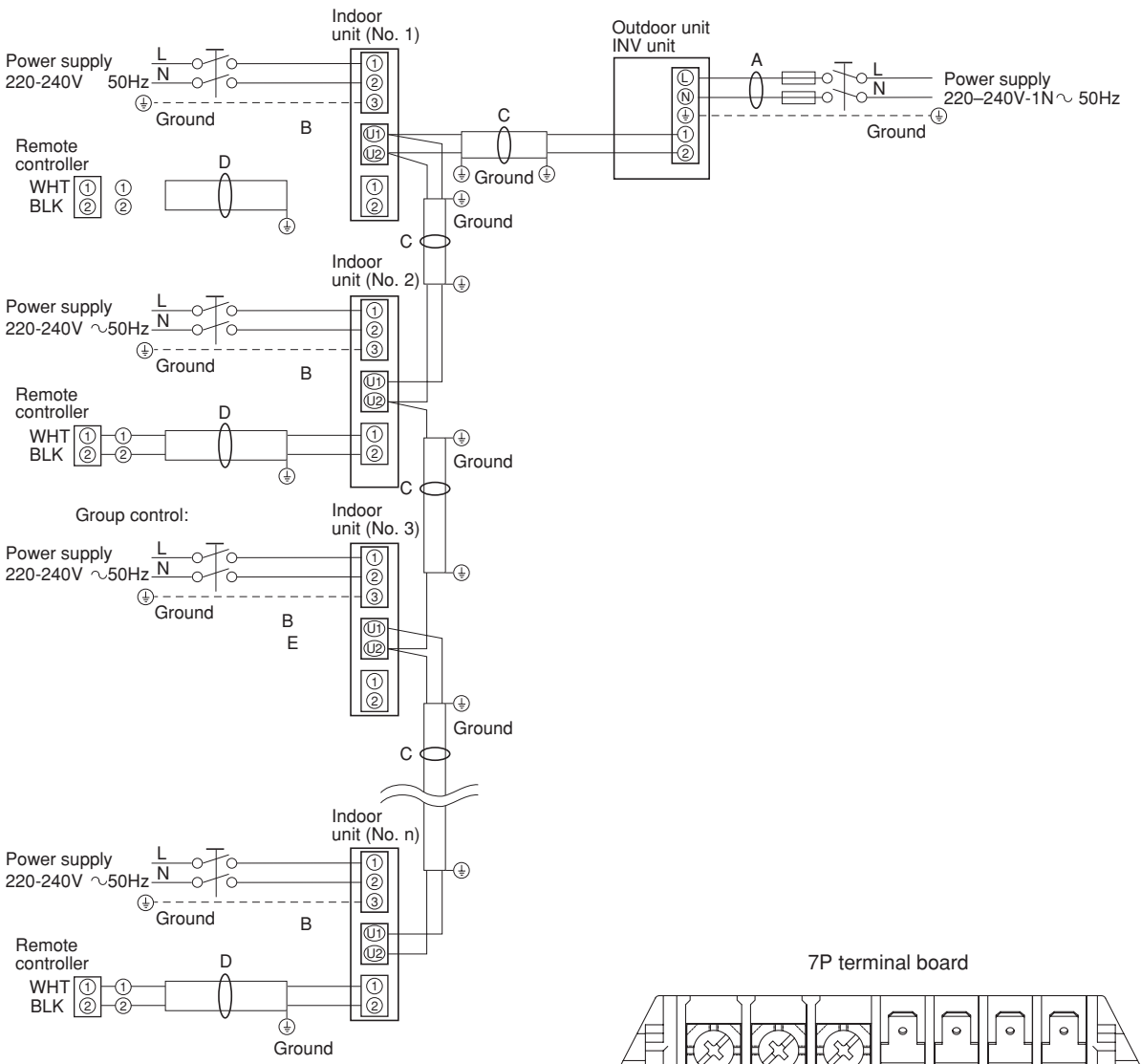
(C) Inter-unit (between outdoor and indoor units) control wiring	(D) Remote control wiring	(E) Control wiring for group control
0.75 mm^2 (AWG #18) **Use shielded wiring***	0.75 mm^2 (AWG #18) **Use shielded wiring**	0.75 mm^2 (AWG #18) **Use shielded wiring**
Max. 1,000 m	Max. 500 m	Max. 500 m (Total)

NOTE

* With ring-type wire terminal.

4. Electrical Wiring

4-3. Wiring System Diagram



NOTE

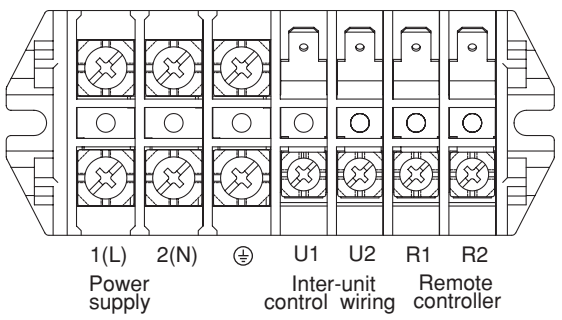
(1) Refer to Section 4-2. “Recommended Wire Length and Wire Diameter for Power Supply System” for the explanation of “A,” “B,” “C,” “D,” and “E,” in the above diagram.

(2) The basic connection diagram of the indoor unit shows the 7P terminal board, so the terminal boards in your equipment may differ from the diagram.

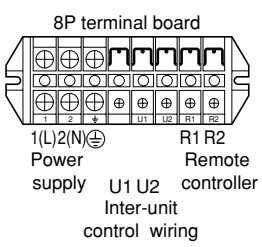
(3) Refrigerant Circuit (R.C.) address should be set before turning the power on.

(4) Regarding the R.C. address setting, refer to page 40 of the Installation Instructions. Auto. address setting can be executed by remote controller automatically. Refer to page 41~45 of the Installation Instructions.

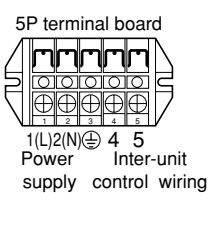
7P terminal board



-- Type



FC-ADS-SD-ASS-ACS



AWS Type

CAUTION

(1) When linking outdoor units in a network (S-net link system), disconnect the terminal extended from the short plug (CN003, 2P Black, location: right bottom on the outdoor main control PCB) from all outdoor units except any one of the outdoor units.
(When shipping: In shorted condition.)

Otherwise the communication of S-net link system is not performed. For a system without link (no connection wiring between outdoor units), do not remove the short plug.

(2) Do not install the inter-unit control wiring in a way that forms a loop. (Fig. 4-1)

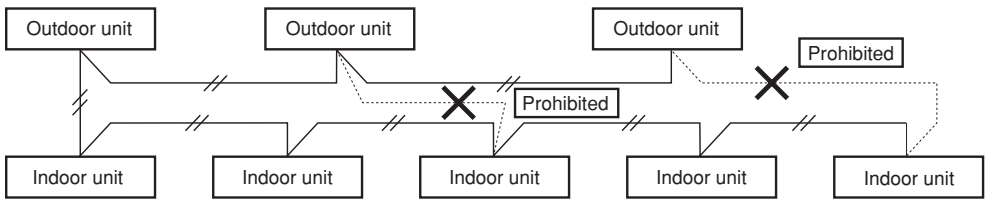


Fig. 4-1

(3) Do not install inter-unit control wiring such as star branch wiring. Star branch wiring causes mis-address setting.

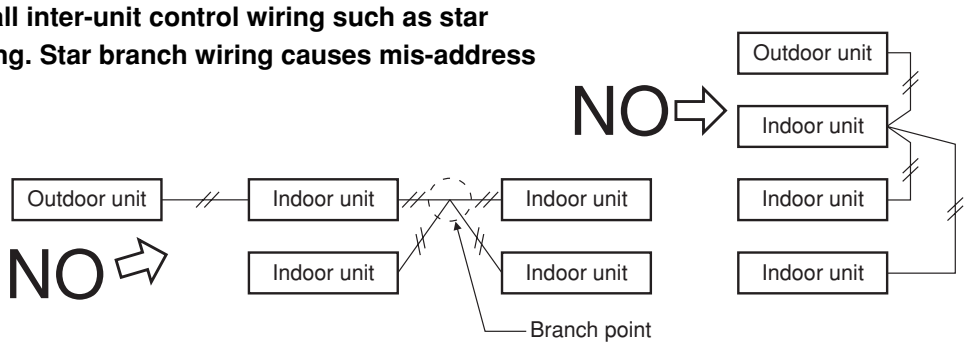


Fig. 4-2

(4) If branching the inter-unit control wiring, the number of branch points should be 16 or fewer. (Branches less than 1 m are not included in the total branch number.) (Fig. 4-3)

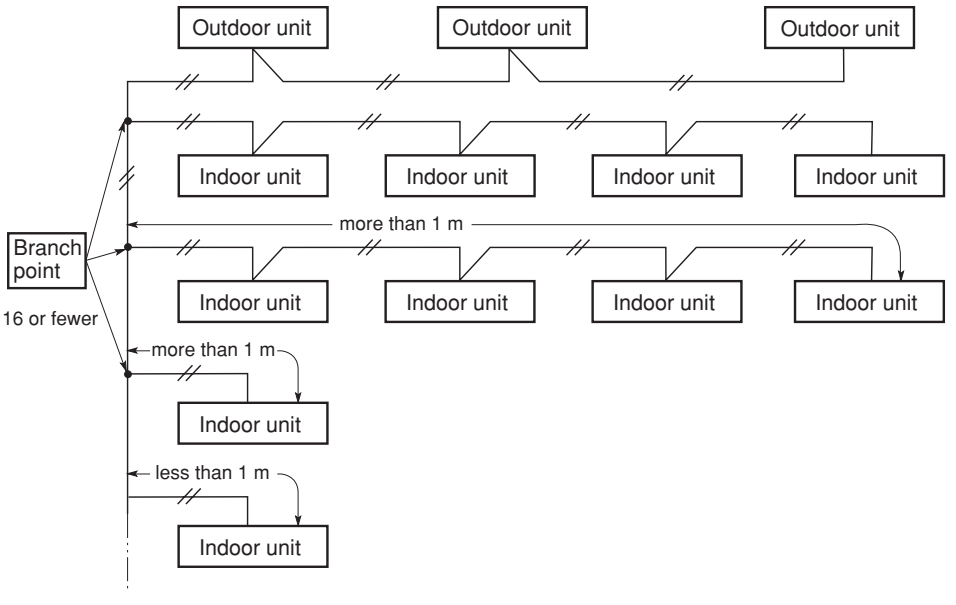


Fig. 4-3

(5) Use shielded wires for inter-unit control wiring (c) and ground the shield on both sides, otherwise misoperation from noise may occur. (Fig. 4-4)
Connect wiring as shown in Section "4-3. Wiring System Diagram."

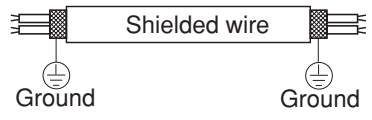


Fig. 4-4

WARNING

Loose wiring may cause the terminal to overheat or result in unit malfunction. A fire hazard may also exist. Therefore, ensure that all wiring is tightly connected.

When connecting each power wire to the terminal, follow the instructions on "How to connect wiring to the terminal" and fasten the wire securely with the fixing screw of the terminal plate.

How to connect wiring to the terminal

■ For stranded wiring

(1) Cut the wire end with cutting pliers, then strip the insulation to expose the stranded wiring about 10 mm and tightly twist the wire ends. (Fig. 4-5)

(2) Using a Phillips head screwdriver, remove the terminal screw(s) on the terminal plate.

(3) Using a ring connector fastener or pliers, securely clamp each stripped wire end with a ring pressure terminal.

(4) Place the ring pressure terminal, and replace and tighten the removed terminal screw using a screwdriver. (Fig. 4-6)

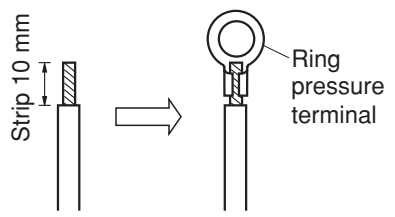


Fig. 4-5

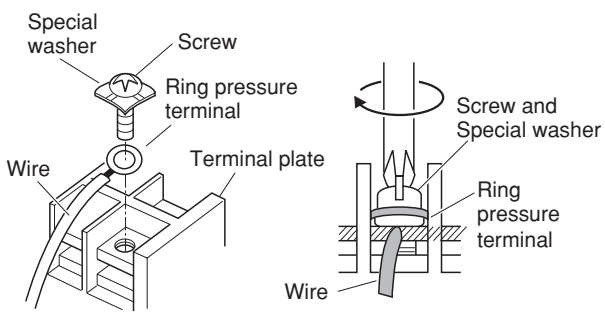


Fig. 4-6

Contents

3. Mini Multiset unit specifications

1. Outdoor Unit

1-1. Specifications **3-**3
1-2. Major Component Specifications **3**-9
1-3. Dimensional Data **3**-15
1-4. Refrigerant Flow Diagram **3**-16
1-5. Sound Data **3**-17

1. Outdoor Unit

1-1. Specifications

Unit specifications (A)

MODEL No.	Outdoor Unit			**AES 04 MMIH**					
POWER SOURCE				220 - 230 - 240 V / Single-phase / 50 / 60 Hz					
PERFORMANCE				Cooling			Heating		
Capacity		kW		11.2			12.5		
		BTU / h		38,200			42,700		
Air circulation (Hi)		m^3/min (cu.ft/min)		100 (3,530)					
ELECTRICAL RATINGS									
Voltage rating		V		220	230	240	220	230	240
Available voltage range		V		198 – 264					
Running amperes		A		14.8	14.1	13.5	15.4	14.7	14.1
Max. running amperes*		A		24.0	24.0	24.0	–	–	–
Power input		kW		2.76	2.76	2.76	2.88	2.88	2.88
Max. power input*		kW		4.90	4.90	4.90	–	–	–
Power factor		%		85	85	85	85	85	85
COP		W/W		4.06	4.06	4.06	4.34	4.34	4.34
Max. starting amperes		A		Approx. 1	Approx. 1	Approx. 1	Approx. 1	Approx. 1	Approx. 1
FEATURES									
Controls				Microprocessor					
Defrost control				Reverse cycle, microprocessor control					
Service function				Sensor temp. recall function Past service warnings recall function					
Refrigerant amount at shipment		kg		R410A - 3.5					
Refrigerant control				Electronic expansion valve					
Operation sound (Hi)	Power level	dB-A		67					
	Pressure level			51					
External finish				Galvanized steel plate with powder paint					
Color (Approximate value)				Munsell 1Y 8.5 / 0.5					
REFRIGERANT TUBING									
Limit of tubing length		m (ft.)		150 (492)					
Limit of elevation difference between the 2 units		m (ft.)		Outdoor unit is higher than indoor unit: 50 (164) Outdoor unit is lower than indoor unit: 40 (131)					
Refrigerant tube outer diameter	Liquid tube	mm (in.)		9.52 (3/8)					
	Gas tube	mm (in.)		15.88 (5/8)					
Refrigerant tubing kit / Joint kit				Optional					
DIMENSIONS & WEIGHT				Unit dimensions			Package dimensions		
Unit dimensions	Height	mm (in.)		1230 (48-7/16)			1331 (52-13/32)		
	Width	mm (in.)		940 (37)			1016 (40)		
	Depth	mm (in.)		340 (13-13/32)			415 (16-11/32)		
Net weight		kg (lbs.)		104 (229)					
Shipping weight		kg (lbs.)		112 (247)					
Shipping volume		m^3 (cu. ft)		0.56 (19.8)					

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Rated conditions
Cooling: Indoor air temperature 27°C DB / 19°C WB; Outdoor air temperature 35°C DB
Heating: Indoor air temperature 20°C DB; Outdoor air temperature 7°C DB / 6°C WB

*Full-load conditions at Indoor / Outdoor capacity ratio 100%
Cooling: Indoor air temperature 32°C DB / 23°C WB; Outdoor air temperature 43°C DB / 26°C WB

1. Outdoor Unit

Unit specifications (B)

MODEL No.	Outdoor Unit			**AES 05 MMIH**					
POWER SOURCE				220 - 230 - 240 V / Single-phase / 50 / 60 Hz					
PERFORMANCE				Cooling			Heating		
Capacity			kW	14.0			16.0		
			BTU / h	47,800			54,600		
Air circulation (Hi)			m^3/min (cu.ft/min)	100 (3,530)					
ELECTRICAL RATINGS									
Voltage rating			V	220	230	240	220	230	240
Available voltage range			V	198 – 264					
Running amperes			A	20.5	19.6	18.8	20.8	19.9	19.1
Max. running amperes*			A	24.0	24.0	24.0	–	–	–
Power input			kW	3.83	3.83	3.83	3.90	3.90	3.90
Max. power input*			kW	4.90	4.90	4.90	–	–	–
Power factor			%	85	85	85	85	85	85
COP			W/W	3.66	3.66	3.66	4.10	4.10	4.10
Max. starting amperes			A	Approx. 1	Approx. 1	Approx. 1	Approx. 1	Approx. 1	Approx. 1
FEATURES									
Controls				Microprocessor					
Defrost control				Reverse cycle, microprocessor control					
Service function				Sensor temp. recall function Past service warnings recall function					
Refrigerant amount at shipment			kg	R410A - 3.5					
Refrigerant control				Electronic expansion valve					
Operation sound (Hi)	Power level		dB-A	67					
	Pressure level			51					
External finish				Galvanized steel plate with powder paint					
Color (Approximate value)				Munsell 1Y 8.5 / 0.5					
REFRIGERANT TUBING									
Limit of tubing length			m (ft.)	150 (492)					
Limit of elevation difference between the 2 units			m (ft.)	Outdoor unit is higher than indoor unit: 50 (164) Outdoor unit is lower than indoor unit: 40 (131)					
Refrigerant tube outer diameter	Liquid tube		mm (in.)	9.52 (3/8)					
	Gas tube		mm (in.)	15.88 (5/8)					
Refrigerant tubing kit / Joint kit				Optional					
DIMENSIONS & WEIGHT				Unit dimensions			Package dimensions		
Unit dimensions	Height		mm (in.)	1230 (48-7/16)			1331 (52-13/32)		
	Width		mm (in.)	940 (37)			1016 (40)		
	Depth		mm (in.)	340 (13-13/32)			415 (16-11/32)		
Net weight			kg (lbs.)	104 (229)					
Shipping weight			kg (lbs.)	112 (247)					
Shipping volume			m^3 (cu. ft)	0.56 (19.8)					

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Rated conditions
Cooling: Indoor air temperature 27°C DB / 19°C WB; Outdoor air temperature 35°C DB
Heating: Indoor air temperature 20°C DB; Outdoor air temperature 7°C DB / 6°C WB

*Full-load conditions at Indoor / Outdoor capacity ratio 100%
Cooling: Indoor air temperature 32°C DB / 23°C WB; Outdoor air temperature 43°C DB / 26°C WB

1. Outdoor Unit

Unit specifications (C)

MODEL No.	Outdoor Unit			**AES 06 MMIH**					
POWER SOURCE				220 - 230 - 240 V / Single-phase / 50 / 60 Hz					
PERFORMANCE				Cooling			Heating		
Capacity			kW	15.5			17.6		
			BTU / h	52,900			60,000		
Air circulation (Hi)			m^3/min (cu.ft/min)	100 (3,530)					
ELECTRICAL RATINGS									
Voltage rating			V	220	230	240	220	230	240
Available voltage range			V	198 – 264					
Running amperes			A	24.4	23.4	22.4	24.5	23.4	22.5
Max. running amperes*			A	28.0	28.0	28.0	–	–	–
Power input			kW	4.57	4.57	4.57	4.58	4.58	4.58
Max. power input*			kW	5.72	5.72	5.72	–	–	–
Power factor			%	85	85	85	85	85	85
COP			W/W	3.39	3.39	3.39	3.84	3.84	3.84
Max. starting amperes			A	Approx. 1	Approx. 1	Approx. 1	Approx. 1	Approx. 1	Approx. 1
FEATURES									
Controls				Microprocessor					
Defrost control				Reverse cycle, microprocessor control					
Service function				Sensor temp. recall function Past service warnings recall function					
Refrigerant amount at shipment			kg	R410A - 3.5					
Refrigerant control				Electronic expansion valve					
Operation sound (Hi)	Power level		dB-A	68					
	Pressure level			52					
External finish				Galvanized steel plate with powder paint					
Color (Approximate value)				Munsell 1Y 8.5 / 0.5					
REFRIGERANT TUBING									
Limit of tubing length			m (ft.)	150 (492)					
Limit of elevation difference between the 2 units			m (ft.)	Outdoor unit is higher than indoor unit: 50 (164) Outdoor unit is lower than indoor unit: 40 (131)					
Refrigerant tube outer diameter	Liquid tube		mm (in.)	9.52 (3/8)					
	Gas tube		mm (in.)	19.05 (3/4)					
Refrigerant tubing kit / Joint kit				Optional					
DIMENSIONS & WEIGHT				Unit dimensions			Package dimensions		
Unit dimensions	Height		mm (in.)	1230 (48-7/16)			1331 (52-13/32)		
	Width		mm (in.)	940 (37)			1016 (40)		
	Depth		mm (in.)	340 (13-13/32)			415 (16-11/32)		
Net weight			kg (lbs.)	104 (229)					
Shipping weight			kg (lbs.)	112 (247)					
Shipping volume			m^3 (cu. ft)	0.56 (19.8)					

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Rated conditions
Cooling: Indoor air temperature 27°C DB / 19°C WB; Outdoor air temperature 35°C DB
Heating: Indoor air temperature 20°C DB; Outdoor air temperature 7°C DB / 6°C WB

*Full-load conditions at Indoor / Outdoor capacity ratio 100%
Cooling: Indoor air temperature 32°C DB / 23°C WB; Outdoor air temperature 43°C DB / 26°C WB

1. Outdoor Unit

Unit specifications (D)

MODEL No.	Outdoor Unit			**AES 04 MMIH**		
POWER SOURCE				220 - 230 - 240 V / Single-phase / 50 / 60 Hz		
PERFORMANCE				Cooling		
Capacity			kW	11.2		
			BTU / h	38,200		
Air circulation (Hi)			m^3/min (cu.ft/min)	100 (3,530)		
ELECTRICAL RATINGS						
Voltage rating			V	220	230	240
Available voltage range			V	198 – 264		
Running amperes			A	14.8	14.1	13.5
Max. running amperes*			A	24.0	24.0	24.0
Power input			kW	2.76	2.76	2.76
Max. power input*			kW	4.90	4.90	4.90
Power factor			%	85	85	85
COP			W/W	4.06	4.06	4.06
Max. starting amperes			A	Approx. 1	Approx. 1	Approx. 1
FEATURES						
Controls				Microprocessor		
Service function				Sensor temp. recall function Past service warnings recall function		
Refrigerant amount at shipment			kg	R410A - 3.5		
Refrigerant control				Electronic expansion valve		
Operation sound (Hi)	Power level		dB-A	67		
	Pressure level			51		
External finish				Galvanized steel plate with powder paint		
Color (Approximate value)				Munsell 1Y 8.5 / 0.5		
REFRIGERANT TUBING						
Limit of tubing length			m (ft.)	150 (492)		
Limit of elevation difference between the 2 units			m (ft.)	Outdoor unit is higher than indoor unit: 50 (164) Outdoor unit is lower than indoor unit: 40 (131)		
Refrigerant tube outer diameter	Liquid tube		mm (in.)	9.52 (3/8)		
	Gas tube		mm (in.)	15.88 (5/8)		
Refrigerant tubing kit / Joint kit				Optional		
DIMENSIONS & WEIGHT				Unit dimensions	Package dimensions	
Unit dimensions	Height		mm (in.)	1230 (48-7/16)	1331 (52-13/32)	
	Width		mm (in.)	940 (37)	1016 (40)	
	Depth		mm (in.)	340 (13-13/32)	415 (16-11/32)	
Net weight			kg (lbs.)	104 (229)		
Shipping weight			kg (lbs.)	112 (247)		
Shipping volume			m^3 (cu. ft)	0.56 (19.8)		

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Rated conditions
Cooling: Indoor air temperature 27°C DB / 19°C WB; Outdoor air temperature 35°C DB

*Full-load conditions at Indoor / Outdoor capacity ratio 100%
Cooling: Indoor air temperature 32°C DB / 23°C WB; Outdoor air temperature 43°C DB / 26°C WB

1. Outdoor Unit

Unit specifications (E)

MODEL No.	Outdoor Unit		**AES 05 MMIH**		
POWER SOURCE			220 - 230 - 240 V / Single-phase / 50 / 60 Hz		
PERFORMANCE			Cooling		
Capacity		kW	14.0		
		BTU / h	47,800		
Air circulation (Hi)		m^3/min (cu.ft/min)	100 (3,530)		
ELECTRICAL RATINGS					
Voltage rating		V	220	230	240
Available voltage range		V			
Running amperes		A	20.5	19.6	18.8
Max. running amperes*		A	24.0	24.0	24.0
Power input		kW	3.83	3.83	3.83
Max. power input*		kW	4.90	4.90	4.90
Power factor		%	85	85	85
COP		W/W	3.66	3.66	3.66
Max. starting amperes		A	Approx. 1	Approx. 1	Approx. 1
FEATURES					
Controls			Microprocessor		
Service function			Sensor temp. recall function Past service warnings recall function		
Refrigerant amount at shipment		kg	R410A - 3.5		
Refrigerant control			Electronic expansion valve		
Operation sound (Hi)	Power level	dB-A	67		
	Pressure level		51		
External finish			Galvanized steel plate with powder paint		
Color (Approximate value)			Munsell 1Y 8.5 / 0.5		
REFRIGERANT TUBING					
Limit of tubing length		m (ft.)	150 (492)		
Limit of elevation difference between the 2 units		m (ft.)	Outdoor unit is higher than indoor unit: 50 (164) Outdoor unit is lower than indoor unit: 40 (131)		
Refrigerant tube outer diameter	Liquid tube	mm (in.)	9.52 (3/8)		
	Gas tube	mm (in.)	15.88 (5/8)		
Refrigerant tubing kit / Joint kit			Optional		
DIMENSIONS & WEIGHT			Unit dimensions	Package dimensions	
Unit dimensions	Height	mm (in.)	1230 (48-7/16)	1331 (52-13/32)	
	Width	mm (in.)	940 (37)	1016 (40)	
	Depth	mm (in.)	340 (13-13/32)	415 (16-11/32)	
Net weight		kg (lbs.)	104 (229)		
Shipping weight		kg (lbs.)	112 (247)		
Shipping volume		m^3 (cu. ft)	0.56 (19.8)		

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Rated conditions
Cooling: Indoor air temperature 27°C DB / 19°C WB; Outdoor air temperature 35°C DB

*Full-load conditions at Indoor / Outdoor capacity ratio 100%
Cooling: Indoor air temperature 32°C DB / 23°C WB; Outdoor air temperature 43°C DB / 26°C WB

1. Outdoor Unit

Unit specifications (F)

MODEL No.	Outdoor Unit		**AES 06 MMIH**		
POWER SOURCE			220 - 230 - 240 V / Single-phase / 50 / 60 Hz		
PERFORMANCE			Cooling		
Capacity		kW	15.5		
		BTU / h	52,900		
Air circulation (Hi)		m^3/min (cu.ft/min)	100 (3,530)		
ELECTRICAL RATINGS					
Voltage rating		V	220	230	240
Available voltage range		V	198 – 264		
Running amperes		A	24.4	23.4	22.4
Max. running amperes*		A	28.0	28.0	28.0
Power input		kW	4.57	4.57	4.57
Max. power input*		kW	5.72	5.72	5.72
Power factor		%	85	85	85
COP		W/W	3.39	3.39	3.39
Max. starting amperes		A	Approx. 1	Approx. 1	Approx. 1
FEATURES					
Controls			Microprocessor		
Service function			Sensor temp. recall function Past service warnings recall function		
Refrigerant amount at shipment		kg	R410A - 3.5		
Refrigerant control			Electronic expansion valve		
Operation sound (Hi)	Power level	dB-A	68		
	Pressure level		52		
External finish			Galvanized steel plate with powder paint		
Color (Approximate value)			Munsell 1Y 8.5 / 0.5		
REFRIGERANT TUBING					
Limit of tubing length		m (ft.)	150 (492)		
Limit of elevation difference between the 2 units		m (ft.)	Outdoor unit is higher than indoor unit: 50 (164) Outdoor unit is lower than indoor unit: 40 (131)		
Refrigerant tube outer diameter	Liquid tube	mm (in.)	9.52 (3/8)		
	Gas tube	mm (in.)	19.05 (3/4)		
Refrigerant tubing kit / Joint kit			Optional		
DIMENSIONS & WEIGHT			Unit dimensions	Package dimensions	
Unit dimensions	Height	mm (in.)	1230 (48-7/16)	1331 (52-13/32)	
	Width	mm (in.)	940 (37)	1016 (40)	
	Depth	mm (in.)	340 (13-13/32)	415 (16-11/32)	
Net weight		kg (lbs.)	104 (229)		
Shipping weight		kg (lbs.)	112 (247)		
Shipping volume		m^3 (cu. ft)	0.56 (19.8)		

DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Rated conditions
Cooling: Indoor air temperature 27°C DB / 19°C WB; Outdoor air temperature 35°C DB

*Full-load conditions at Indoor / Outdoor capacity ratio 100%
Cooling: Indoor air temperature 32°C DB / 23°C WB; Outdoor air temperature 43°C DB / 26°C WB

1. Outdoor Unit

1-2. Major Component Specifications

Outdoor unit (A)

MODEL No.		**AES 04 MMIH**
Power source		220 - 230 - 240 V / 1N / 50 Hz
Controller P.C.B. Ass'y		CR-CR365GXH56
Control circuit fuse		250V, 6.3A
Compressor		INV (Inverter)
Type		Rotary (Hermetic)
Model ... Code No.		C-9RVN273H0T ... 808673805
Motor rated output	kW	2.1
Compressor oil (ETHER FV68S)	cc	1,900
Coil resistance (Ambient temperature 25°C)		V - U: 0.138, U - W: 0.138 W - V: 0.138
Safety devices		
Thermal protector ON / OFF		—
Microprocessor safety devices		Compressor current detection circuit Compressor discharge gas temperature control
Crank case heater	V, W	240, 25
High pressure switch		
Set pressure ON / OFF	MPa	—
Fan (Number ... diameter (mm))		Propeller (1 ... ø460) · 2
Fan motor		
Model ... Nominal output	W	UGBTEF – 95STS503 / 504 ... 90W
No. of pole ... r.p.m.		8 ... 250 – 800
Safety device		
Microprocessor safety devices		Yes
Heat exchanger		
Coil		Aluminum plate fin / Copper tube
Rows…fin pitch	mm	3 … 1.4
Face area	m^2	3.25

1. Outdoor Unit

Outdoor unit (B)

MODEL No.		**AES 05 MMIH**
Power source		220 - 230 - 240 V / 1N / 50 Hz
Controller P.C.B. Ass'y		CR-CR365GXH56
Control circuit fuse		250V, 6.3A
Compressor		INV (Inverter)
Type		Rotary (Hermetic)
Model ... Code No.		C-9RVN273H0T ... 808673805
Motor rated output	kW	3.3
Compressor oil (ETHER FV68S)	cc	1,900
Coil resistance (Ambient temperature 25°C)		V - U: 0.138, U - W: 0.138 W - V: 0.138
Safety devices		
Thermal protector ON / OFF		—
Microprocessor safety devices		Compressor current detection circuit Compressor discharge gas temperature control
Crank case heater	V, W	240, 25
High pressure switch		
Set pressure ON / OFF	MPa	—
Fan (Number ... diameter (mm))		Propeller (1 ... ø460) · 2
Fan motor		
Model ... Nominal output	W	UGBTEF – 95STS503 / 504 ... 90W
No. of pole ... r.p.m.		8 ... 250 – 800
Safety device		
Microprocessor safety devices		Yes
Heat exchanger		
Coil		Aluminum plate fin / Copper tube
Rows…fin pitch	mm	3 … 1.4
Face area	m^2	3.25

1. Outdoor Unit

Outdoor unit (C)

MODEL No.			**AES 06 MMIH**
Power source			220 - 230 - 240 V / 1N / 50 Hz
Controller P.C.B. Ass'y			CR-CR605GXH56
Control circuit fuse			250V, 6.3A
Compressor			INV (Inverter)
Type			Rotary (Hermetic)
Model ... Code No.			C-9RVN273H0T ... 808673805
Motor rated output		kW	4.0
Compressor oil (ETHER FV68S)		cc	1,900
Coil resistance (Ambient temperature 25°C)			V - U: 0.138, U - W: 0.138 W - V: 0.138
Safety devices			
Thermal protector ON / OFF			—
Microprocessor safety devices			Compressor current detection circuit Compressor discharge gas temperature control
Crank case heater		V, W	240, 25
High pressure switch			
Set pressure ON / OFF		MPa	—
Fan (Number ... diameter (mm))			Propeller (1 ... ø460) · 2
Fan motor			
Model ... Nominal output		W	UGBTEF – 95STS503 / 504 ... 90W
No. of pole ... r.p.m.			8 ... 250 – 800
Safety device			
Microprocessor safety devices			Yes
Heat exchanger			
Coil			Aluminum plate fin / Copper tube
Rows…fin pitch		mm	3 … 1.4
Face area		m^2	3.25

1. Outdoor Unit

Outdoor unit (D)

MODEL No.			**AES 04 MMIH**
Power source			220 - 230 - 240 V / 1N / 50 Hz
Controller P.C.B. Ass'y			CR-CR365GXH56
Compressor			INV (Inverter)
	Type		Rotary (Hermetic)
	Model ... Code No.		C-9RVN273H0T ... 808673805
	Motor rated output	kW	2.1
	Compressor oil (ETHER FV68S)	cc	1,900
	Coil resistance (Ambient temperature 25°C)		V - U: 0.138, U - W: 0.138 W - V: 0.138
	Safety devices		
	Thermal protector ON / OFF		—
	Microprocessor safety devices		Compressor current detection circuit Compressor discharge gas temperature control
	Crank case heater	V, W	240, 25
High pressure switch			
	Set pressure ON / OFF	MPa	—
Fan (Number ... diameter (mm))			Propeller (1 ... ø460) · 2
Fan motor			
	Model ... Nominal output	W	UGBTEF – 95STS503 / 504 ... 90W
	No. of pole ... r.p.m.		8 ... 250 – 800
	Safety device		
	Microprocessor safety devices		Yes
Heat exchanger			
	Coil		Aluminum plate fin / Copper tube
	Rows…fin pitch	mm	3 … 1.4
	Face area	m^2	3.25

1. Outdoor Unit

Outdoor unit (E)

MODEL No.			**AES 05 MMIH**
Power source			220 - 230 - 240 V / 1N / 50 Hz
Controller P.C.B. Ass'y			CR-CR365GXH56
Control circuit fuse			250V, 6.3A
Compressor			INV (Inverter)
Type			Rotary (Hermetic)
Model ... Code No.			C-9RVN273H0T ... 808673805
Motor rated output		kW	3.3
Compressor oil (ETHER FV68S)		cc	1,900
Coil resistance (Ambient temperature 25°C)			V - U: 0.138, U - W: 0.138 W - V: 0.138
Safety devices			
Thermal protector ON / OFF			—
Microprocessor safety devices			Compressor current detection circuit Compressor discharge gas temperature control
Crank case heater		V, W	240, 25
High pressure switch			
Set pressure ON / OFF		MPa	—
Fan (Number ... diameter (mm))			Propeller (1 ... ø460) · 2
Fan motor			
Model ... Nominal output		W	UGBTEF – 95STS503 / 504 ... 90W
No. of pole ... r.p.m.			8 ... 250 – 800
Safety device			
Microprocessor safety devices			Yes
Heat exchanger			
Coil			Aluminum plate fin / Copper tube
Rows…fin pitch		mm	3 … 1.4
Face area		m^2	3.25

1. Outdoor Unit

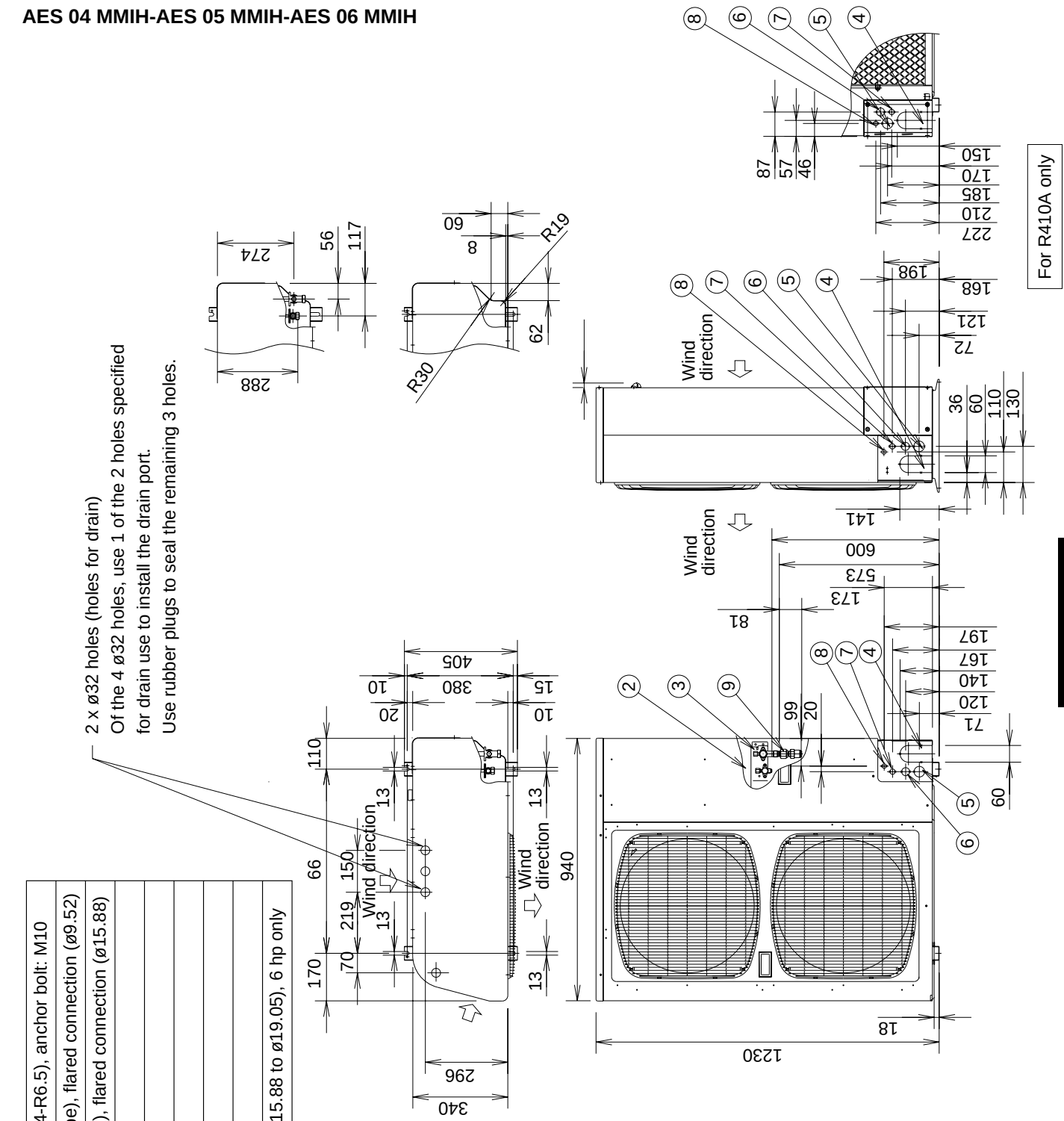
Outdoor unit (F)

MODEL No.		**AES 06 MMIH**
Power source		220 - 230 - 240 V / 1N / 50 Hz
Controller P.C.B. Ass'y		CR-CR605GXH56
Control circuit fuse		250V, 6.3A
Compressor		INV (Inverter)
Type		Rotary (Hermetic)
Model ... Code No.		C-9RVN273H0T ... 808673805
Motor rated output	kW	4
Compressor oil (ETHER FV68S)	cc	1,900
Coil resistance (Ambient temperature 25°C)		V - U: 0.138, U - W: 0.138 W - V: 0.138
Safety devices		
Thermal protector ON / OFF		—
Microprocessor safety devices		Compressor current detection circuit Compressor discharge gas temperature control
Crank case heater	V, W	240, 25
High pressure switch		
Set pressure ON / OFF	MPa	—
Fan (Number ... diameter (mm))		Propeller (1 ... ø460) · 2
Fan motor		
Model ... Nominal output	W	UGBTEF – 95STS503 / 504 ... 90W
No. of pole ... r.p.m.		8 ... 250 – 800
Safety device		
Microprocessor safety devices		Yes
Heat exchanger		
Coil		Aluminum plate fin / Copper tube
Rows…fin pitch	mm	3 … 1.4
Face area	m^2	3.25

1. Outdoor Unit

1-3. Dimensional Data

AES 04 MMIH-AES 05 MMIH-AES 06 MMIH

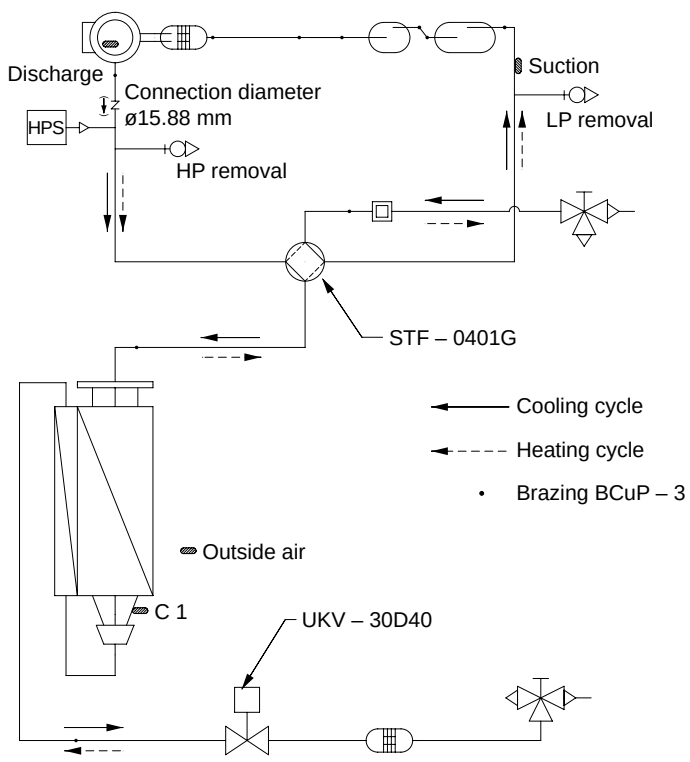

For R410A only
Wind direction
2 x ø32 holes (holes for drain)
Of the 4 ø32 holes, use 1 of the 2 holes specified for drain use to install the drain port.
Use rubber plugs to seal the remaining 3 holes.

①	Installation anchoring hole (4-R6.5), anchor bolt: M10
②	Refrigerant tubing (liquid tube), flared connection (ø9.52)
③	Refrigerant tubing (gas tube), flared connection (ø15.88)
④	Refrigerant tubing port
⑤	Electrical wiring port (ø3.8)
⑥	Electrical wiring port (ø2.9)
⑦	Electrical wiring port (ø1.9)
⑧	Electrical wiring port (ø1.6)
⑨	Auxiliary connection tube (ø15.88 to ø19.05), 6 hp only

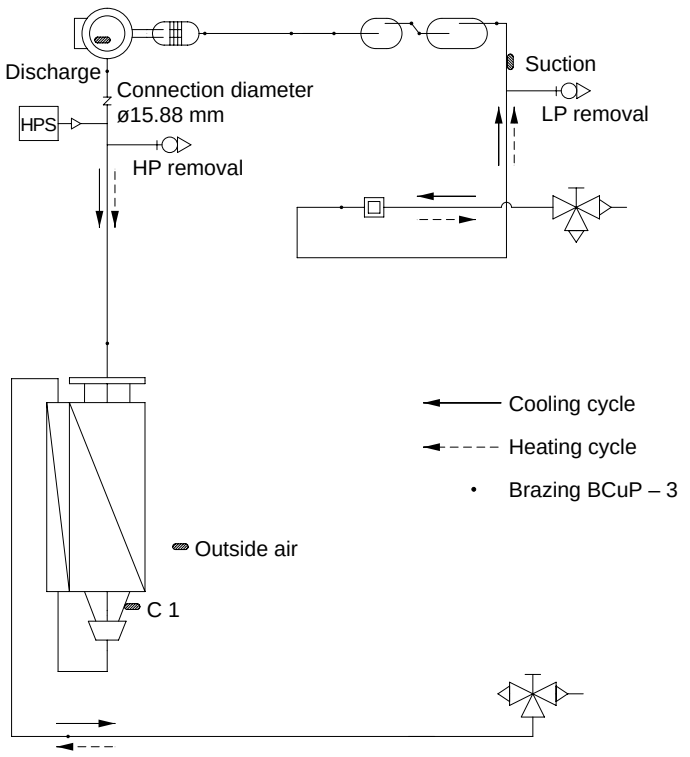
1. Outdoor Unit

1-4. Refrigerant Flow Diagram

AES 04 MMIH 6
AES 05 MMIH
AES 06 MMIH



AES 04 MMIH
AES 05 MMIH
AES 06 MMIH



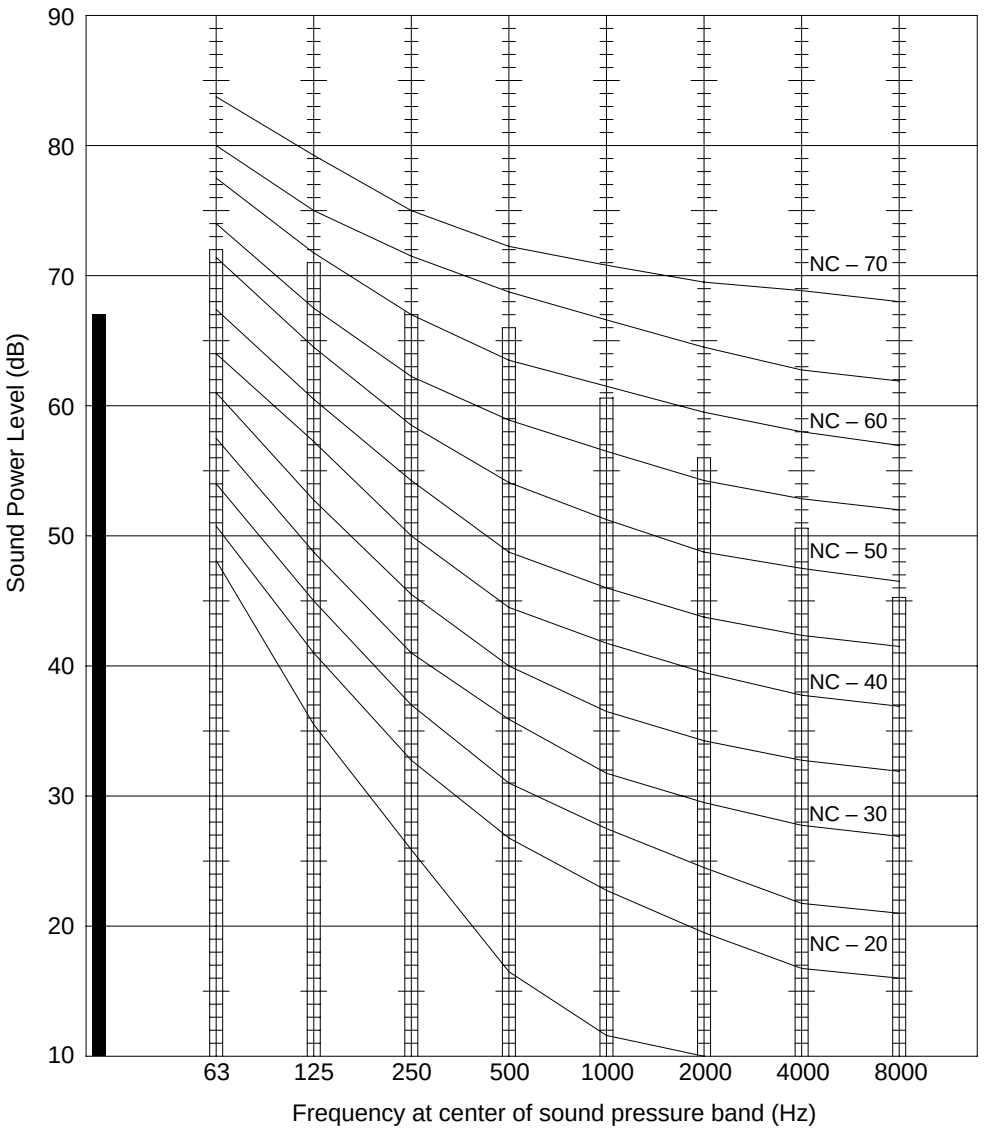
1. Outdoor Unit

1-5. Sound Data

(1) Sound Power Level

AES 04 MMIH 6
AES 05 MMIH

Model	AES 04 MMIH AES 05 MMIH
Sound Power Level	67 dB (A) Cooling
Condition	



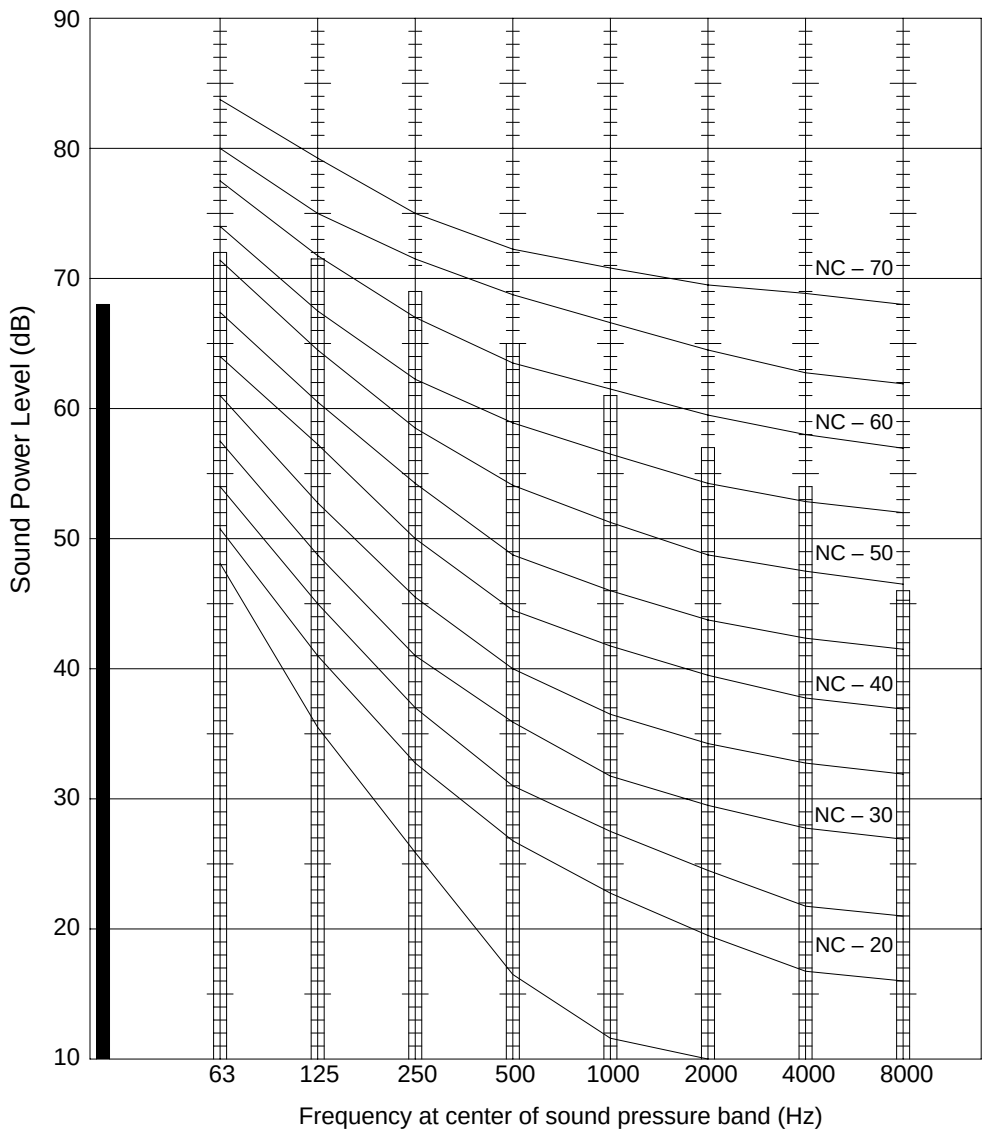
NOTE

1. dBA = A – weighted sound power level (A – scale according to IEC)
2. Reference acoustic intensity 0 dB = 10^{-12} W/m^2

1. Outdoor Unit

AES 06 MMIH

Model	AES 06 MMIH
Sound Power Level	68 dB (A) Cooling
Condition	



NOTE

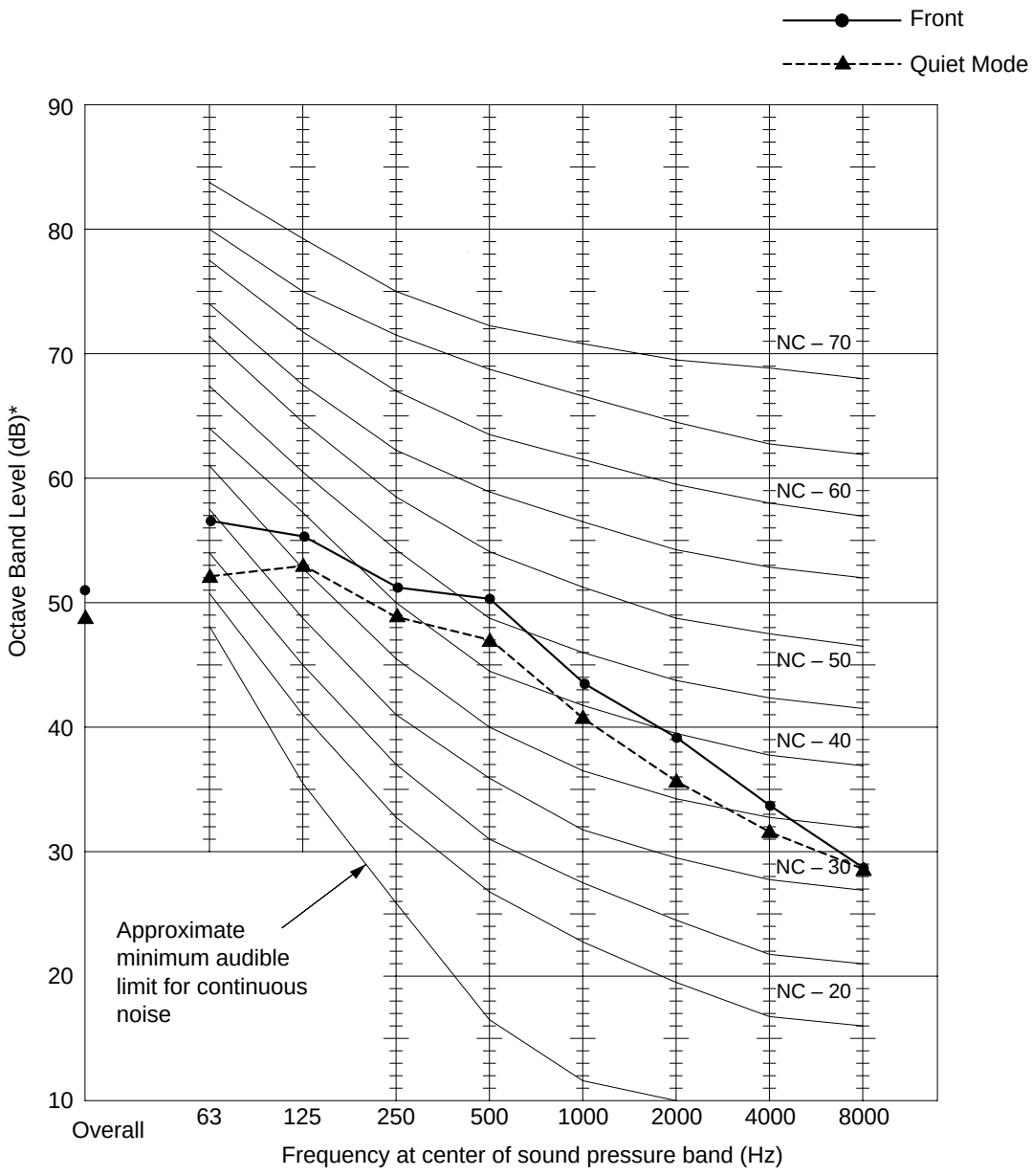
1. dBA = A – weighted sound power level (A – scale according to IEC)
2. Reference acoustic intensity 0 dB = 10^{-12} W/m^2

1. Outdoor Unit

(2) Sound Pressure Level

AES 04 MMIH 6
AES 05 MMIH

Model	AES 04 MMIH AES 05 MMIH
Sound Pressure Level Cooling	Front 51 dB (A) Quiet Mode 48 dB (A)
Condition	1 m in front at height of 1.5 m

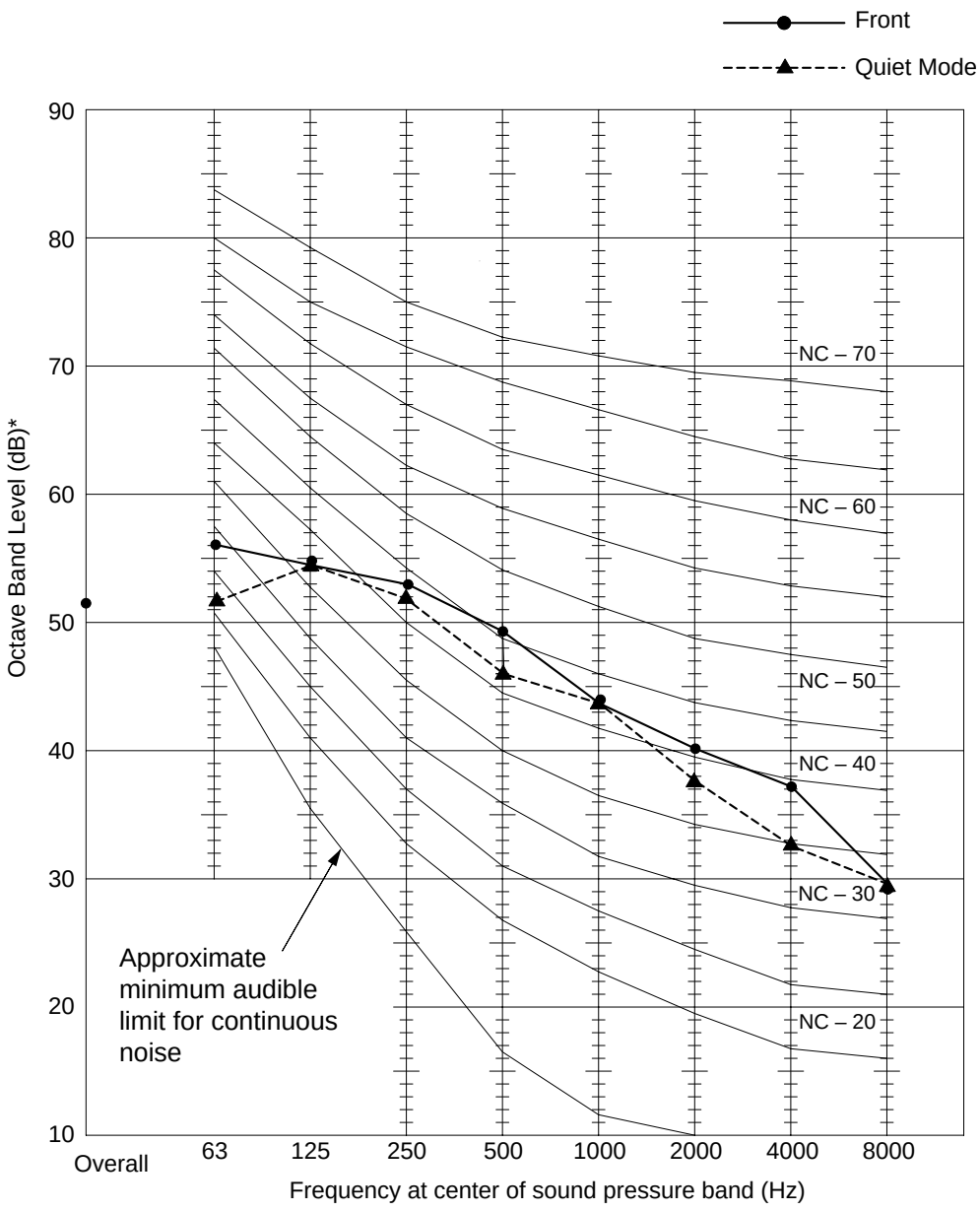


* 0 dB = 0.0002 ∝bar

1. Outdoor Unit

AES 06 MMIH

Model	AES 06 MMIH
Sound Pressure Level Cooling	Front 52 dB (A) Quiet Mode 49 dB (A)
Condition	1 m in front at height of 1.5 m



* 0 dB = 0.0002 ∝bar

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4

1. Air Purging

Air and moisture in the refrigerant system may have undesirable effects as indicated below.

- pressure in the system rises
- operating current rises
- cooling (or heating) efficiency drops
- moisture in the refrigerant circuit may freeze and block capillary tubing
- water may lead to corrosion of parts in the refrigerant system

Therefore, the indoor unit and tubing between the indoor and outdoor unit must be leak tested and evacuated to remove any noncondensables and moisture from the system.

Air Purging with a Vacuum Pump (for Test Run) Preparation

Check that each tube (both liquid and gas tubes) between the indoor and outdoor units has been properly connected and all wiring for the test run has been completed. Remove the valve caps from both the gas tube and liquid tube service valves on the outdoor unit. Note that both liquid and gas tube service valves on the outdoor unit are kept closed at this stage.

Leak test

(1) Attach a manifold valve (with pressure gauges) and dry nitrogen gas cylinder to this service port with charge hoses.

CAUTION

Use a manifold valve for air purging. If it is not available, use a stop valve for this purpose. The “Hi” knob of the manifold valve must always be kept closed.

(2) Pressurize the system to no more than 36 kgf/cm^{2}G with dry nitrogen gas and close the cylinder valve when the gauge reading reaches 36 kgf/cm^{2}G. Then, test for leaks with liquid soap.

CAUTION

To avoid nitrogen entering the refrigerant system in a liquid state, the top of the cylinder must be higher than the bottom when you pressurize the system. Usually, the cylinder is used in a vertical standing position. (Refer to the previous page.)

Manifold gauge

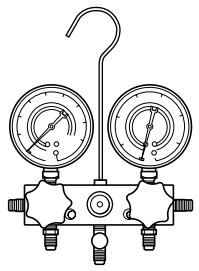


Fig. 5-1

Vacuum pump

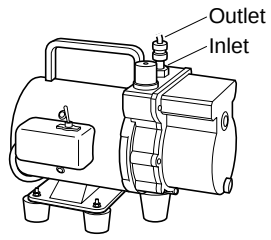


Fig. 5-2

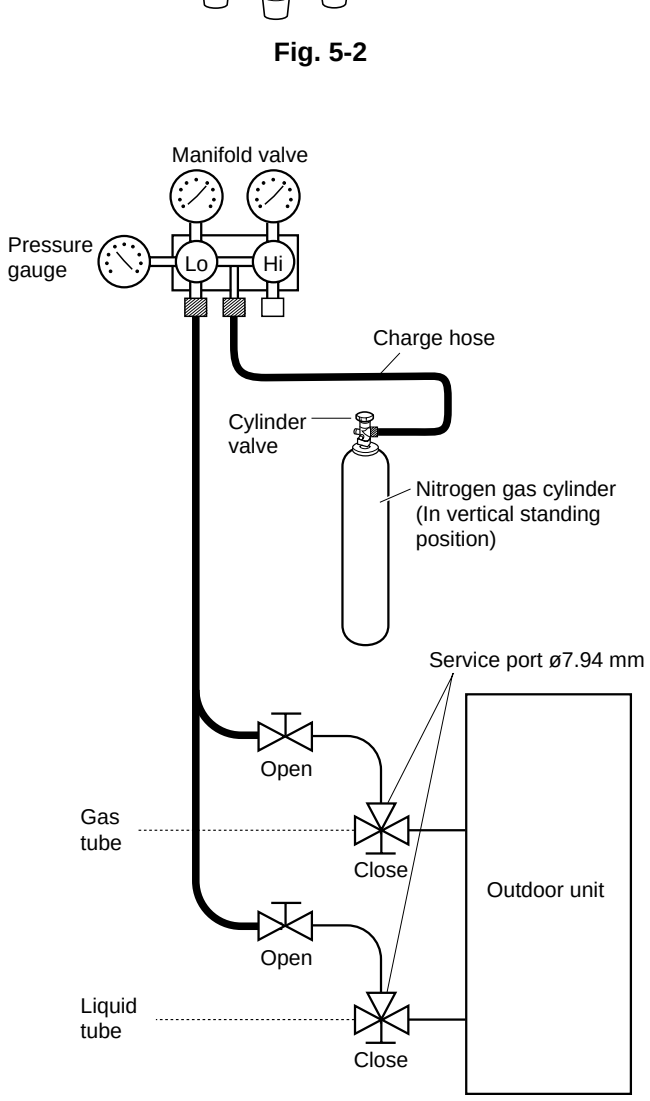


Fig. 5-3

1. Air Purging

(3) Do a leak test of all joints of the tubing (both indoor and outdoor) and both gas tube and liquid tube service valves. Bubbles indicate a leak. Wipe off the soap with a clean cloth after the leak test.

(4) After the system is found to be free of leaks, relieve the nitrogen pressure by loosening the charge hose connector at the nitrogen cylinder. When the system pressure is reduced to normal, disconnect the hose from the cylinder.

Evacuation

(1) Attach the charge hose end described in the preceding steps to the vacuum pump to evacuate the tubing and indoor unit. Confirm that the “Lo” knob of the manifold valve is open. Then, run the vacuum pump. The operation time for evacuation varies with the tubing length and capacity of the pump. The following table shows the amount of time for evacuation:

Required time for evacuation when 30 gal/h vacuum pump is used	
If tubing length is less than 15 m	If tubing length is longer than 15 m
45 min. or more	**90 min. or more**

NOTE

The required time in the above table is calculated based on the assumption that the ideal (or target) vacuum condition is less than 667 Pa (–755 mm Hg, 5 Torr).

(2) When the desired vacuum is reached, close the “Lo” knob of the manifold valve and turn off the vacuum pump. Confirm that the gauge pressure is under 667 Pa (–755 mmHg, 5 Torr) after 4 to 5 minutes of vacuum pump operation.

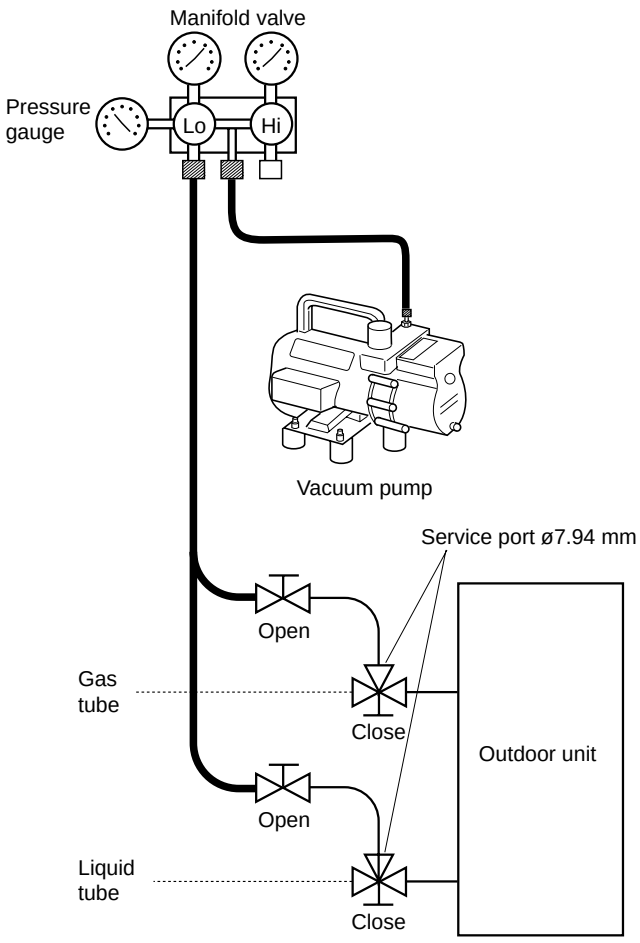


Fig. 5-4

1. Air Purging

CAUTION **Use a cylinder designed for use with R410A respectively.**

Charging additional refrigerant

Charging additional refrigerant (calculated from the liquid tube length as shown in Section 2. 2-7 “Additional Refrigerant Charge”) using the liquid tube service valve. (Fig. 5-5)

Use a balance to measure the refrigerant accurately.

If the additional refrigerant charge amount cannot be charged at once, charge the remaining refrigerant in liquid form by using the gas tube service valve with the system in cooling operation mode at the time of test run. (Fig. 5-6)

Finishing the job

(1) With a hex wrench, turn the liquid tube service valve stem counter-clockwise to fully open the valve.

(2) Turn the gas tube service valve stem counter-clockwise to fully open the valve.

CAUTION **To avoid gas from leaking when removing the charge hose, make sure the stem of the gas tube is turned all the way out (“BACK SEAT” position).**

(3) Loosen the charge hose connected to the gas tube service port (for ø7.94 mm tube) slightly to release the pressure, then remove the hose.

(4) Replace the service port cap on the gas tube service port and fasten the cap securely with an monkey spanner or box wrench. This process is very important to prevent gas from leaking from the system.

(5) Replace the valve caps at both gas tube and liquid tube service valves and fasten them securely.

This completes air purging with a vacuum pump. The air conditioner is now ready for a test run.

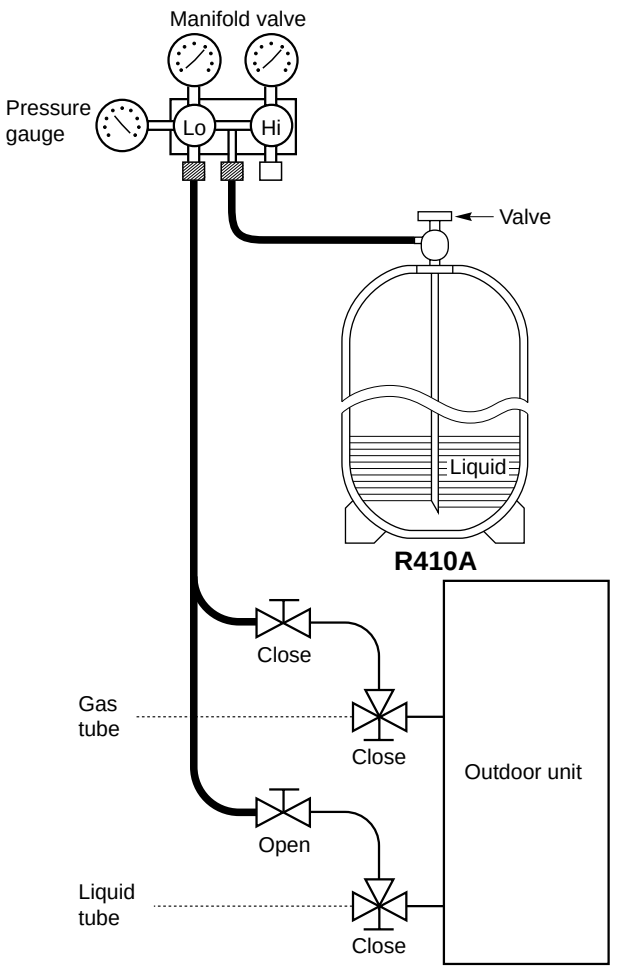


Fig. 5-5

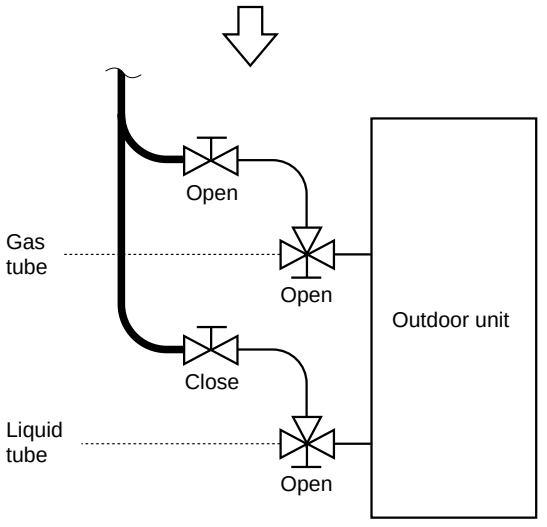


Fig. 5-6

2. Test Run

2-1. Preparing for Test Run

Before attempting to start the air conditioner, check the following.

(1) All loose matter is removed from the cabinet, especially steel filings, bits of wire, and clips.

(2) The control wiring is correctly connected and all electrical connections are tight.

(3) The transportation pads for the indoor fan have been removed. If not, remove them now.

(4) The power has been connected to the unit for at least 5 hours before starting the compressor. The bottom of the compressor should be warm to the touch and the crankcase heater around the feet of the compressor should be hot to the touch. (Fig. 5-7)

(5) Both the gas and liquid tube service valves are open. If not, open them now. (Fig. 5-8)

(6) Request that the customer be present for the trial run.
Explain the contents of the instruction manual, then have the customer actually operate the system.

(7) Be sure to give the instruction manual and warranty certificate to the customer.

(8) When replacing the control PCB, be sure to make all the same settings on the new PCB as were in use before replacement.
The existing EEP ROM is not changed, and is connected to the new control PCB.

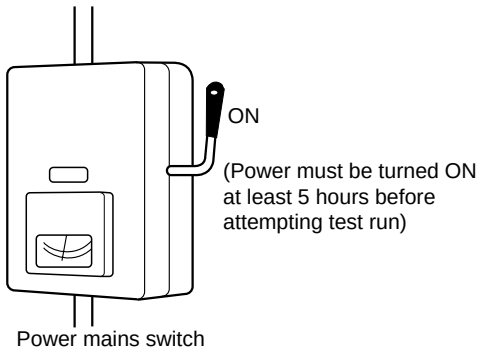


Fig. 5-7

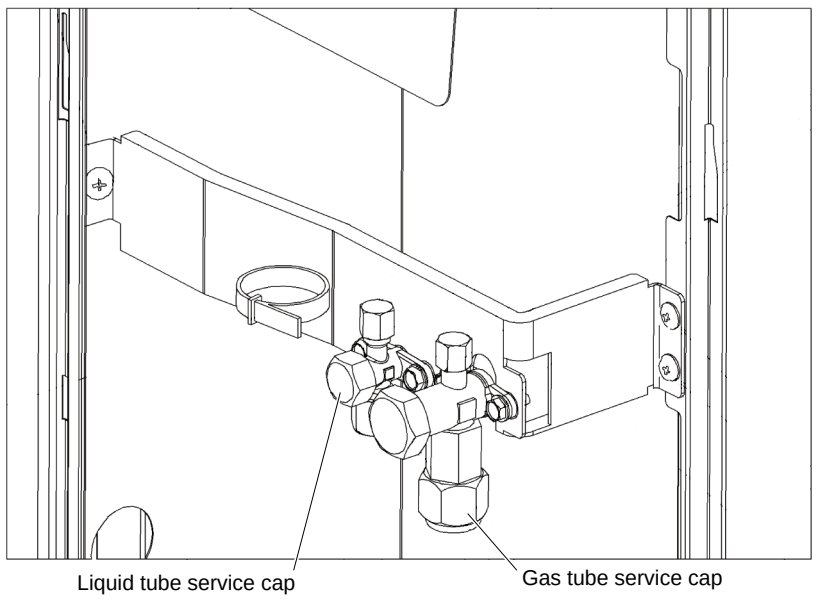


Fig. 5-8

2. Test Run

2-2. Test Run Procedure

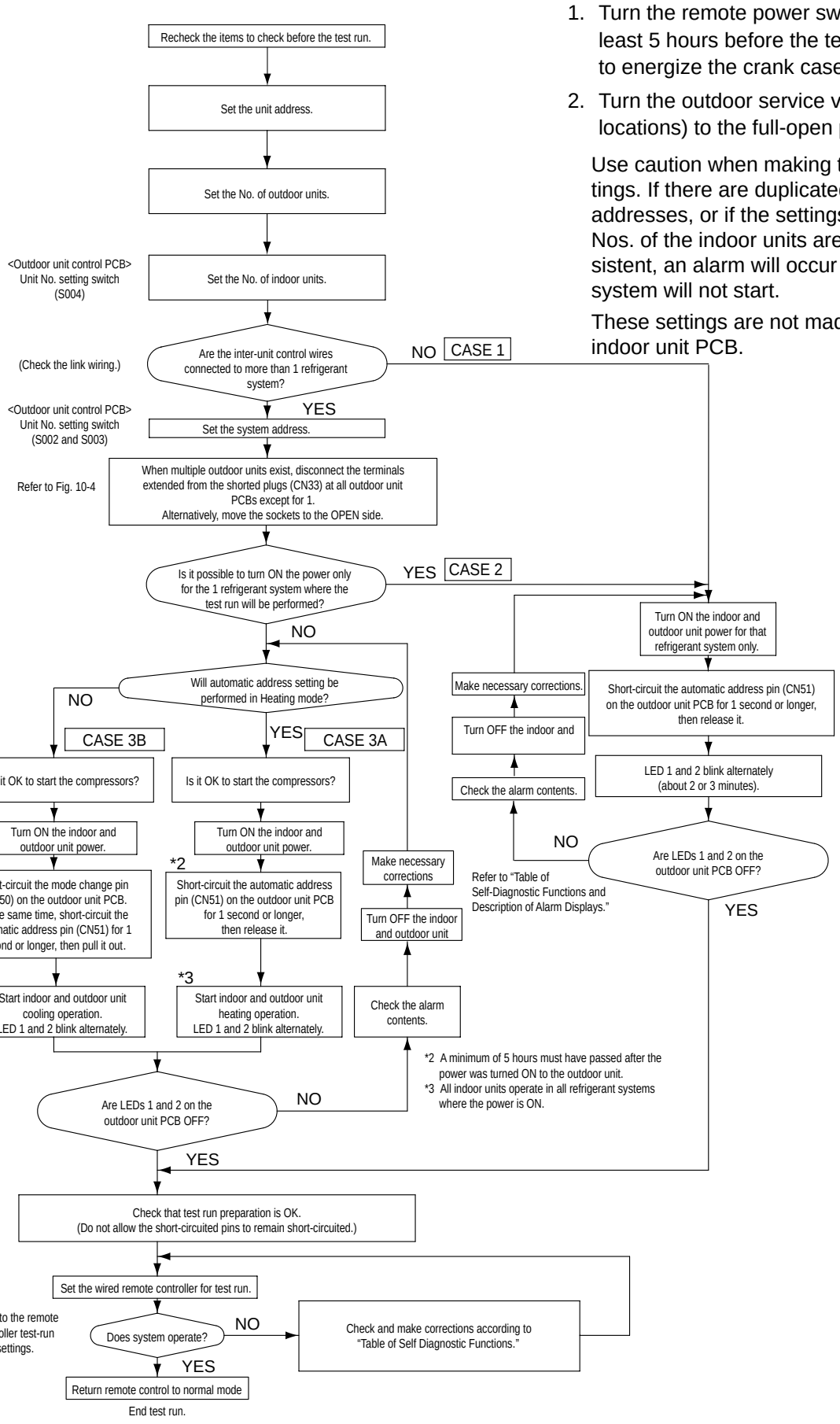

Recheck the items to check before the test run.
Set the unit address.
Set the No. of outdoor units.
<Outdoor unit control PCB>
Unit No. setting switch
(S004)
Set the No. of indoor units.
(Check the link wiring.)
Are the inter-unit control wires connected to more than 1 refrigerant system?
NO
CASE 1
YES
<Outdoor unit control PCB>
Unit No. setting switch
(S002 and S003)
Set the system address.
Refer to Fig. 10-4
When multiple outdoor units exist, disconnect the terminals extended from the shorted plugs (CN33) at all outdoor unit PCBs except for 1.
Alternatively, move the sockets to the OPEN side.
Is it possible to turn ON the power only for the 1 refrigerant system where the test run will be performed?
YES
CASE 2
NO
Will automatic address setting be performed in Heating mode?
NO
CASE 3B
YES
CASE 3A
Is it OK to start the compressors?
Is it OK to start the compressors?
Turn ON the indoor and outdoor unit power.
Turn ON the indoor and outdoor unit power.
*2
Short-circuit the mode change pin (CN50) on the outdoor unit PCB. At the same time, short-circuit the automatic address pin (CN51) for 1 second or longer, then pull it out.
*2
Short-circuit the automatic address pin (CN51) on the outdoor unit PCB for 1 second or longer, then release it.
*3
Start indoor and outdoor unit cooling operation.
LED 1 and 2 blink alternately.
*3
Start indoor and outdoor unit heating operation.
LED 1 and 2 blink alternately.
Are LEDs 1 and 2 on the outdoor unit PCB OFF?
NO
Make necessary corrections
Turn OFF the indoor and outdoor unit
Check the alarm contents.
YES
Check that test run preparation is OK.
(Do not allow the short-circuited pins to remain short-circuited.)
Set the wired remote controller for test run.
Refer to the remote controller test-run settings.
Does system operate?
NO
Check and make corrections according to "Table of Self Diagnostic Functions."
YES
Return remote control to normal mode
End test run.
Turn ON the indoor and outdoor unit power for that refrigerant system only.
Short-circuit the automatic address pin (CN51) on the outdoor unit PCB for 1 second or longer, then release it.
LED 1 and 2 blink alternately (about 2 or 3 minutes).
Are LEDs 1 and 2 on the outdoor unit PCB OFF?
NO
Refer to "Table of Self-Diagnostic Functions and Description of Alarm Displays."
Check the alarm contents.
Make necessary corrections.
Turn OFF the indoor and
YES
*2 A minimum of 5 hours must have passed after the power was turned ON to the outdoor unit.
*3 All indoor units operate in all refrigerant systems where the power is ON.

Fig. 5-9

Items to Check Before the Test Run

1. Turn the remote power switch on at least 5 hours before the test, in order to energize the crank case heater.
2. Turn the outdoor service valves (2 locations) to the full-open positions.

Use caution when making the settings. If there are duplicated system addresses, or if the settings for the Nos. of the indoor units are not consistent, an alarm will occur and the system will not start.

These settings are not made on the indoor unit PCB.

2. Test Run

2-3. Outdoor Unit PCB Setting

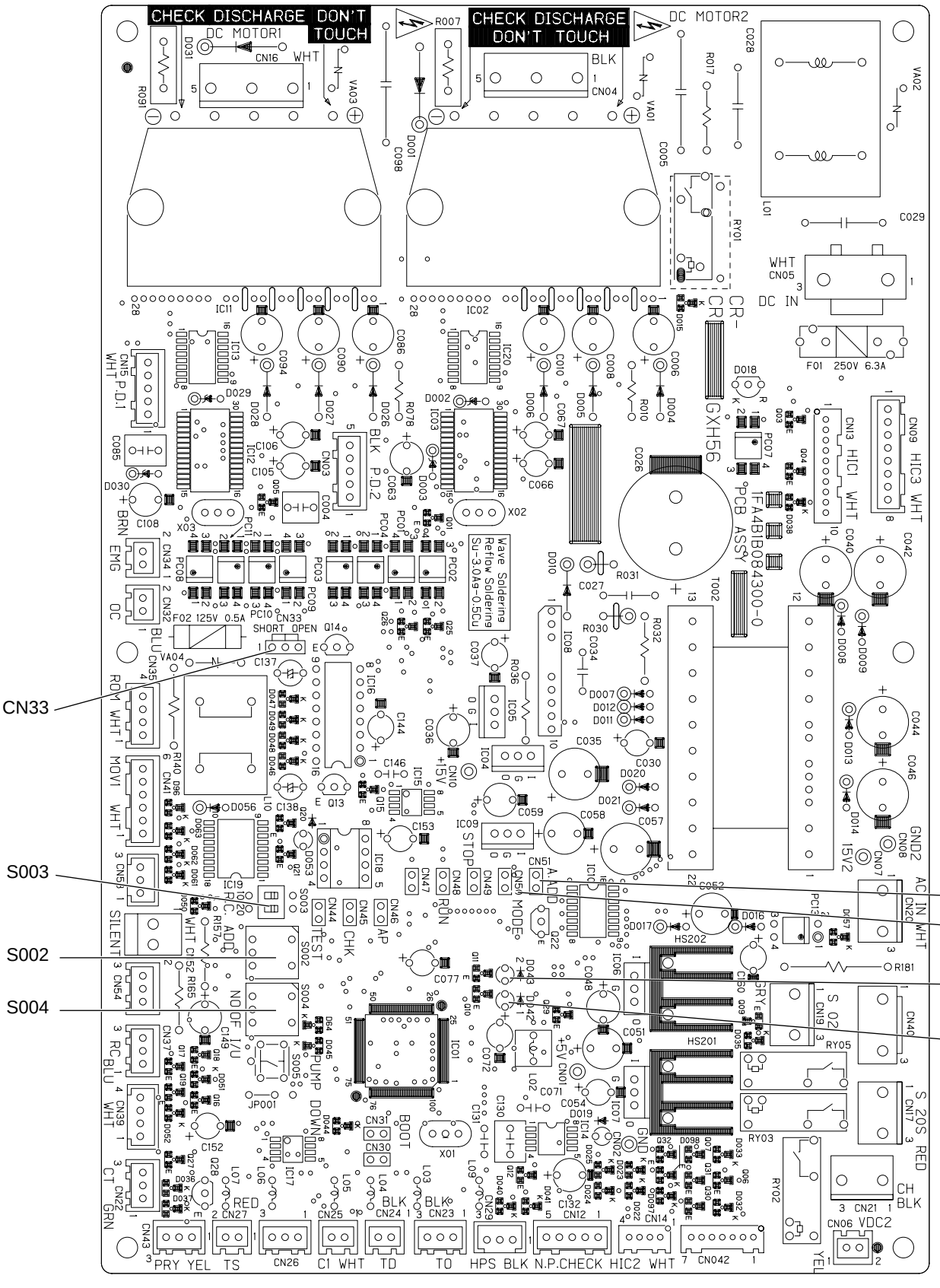


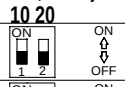
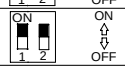
Fig. 5-10

2. Test Run

● **Examples of the No. of indoor units settings**

No. of indoor units	Indoor unit setting (S004) (Rotary switch, red)
1 unit (factory setting)	Set to 1
2 units	Set to 2
≀	≀
9 units	Set to 9

● **Examples of refrigerant circuit (R.C.) address settings (required when link wiring is used)**

System address No.	System address (S003) (2P DIP switch, blue) 10 20	System address (S002) (Rotary switch, black)
System 1 (factory setting)	Both OFF 	Set to 1
System 11	1 ON	Set to 1
System 21	2 ON	Set to 1
System 30	1 & 2 ON 	Set to 0

4

2. Test Run

2-4. Auto Address Setting

Basic wiring diagram: Example (1)

• If link wiring is not used
(The inter-unit control wires are not connected to multiple refrigerant systems.)
Indoor unit addresses can be set without operating the compressors.

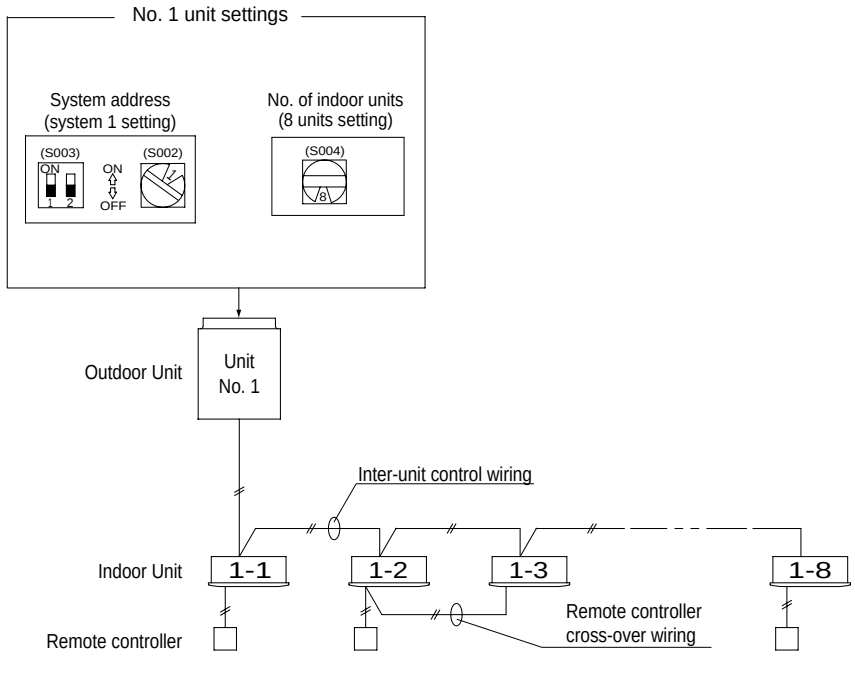
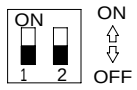


Fig. 5-11

(1) Automatic Address Setting from the Outdoor Unit

1. On the outdoor unit control PCB, check that the system address rotary switch (S002) is set to “1” and that the DIP switch (S003) is set to “0.” 

(These are the settings at the time of factory shipment.)
2. To set the number of indoor units that are connected to the outdoor unit to 8, on the outdoor unit control PCB set the No. of indoor units rotary switch (S004) to “8.”
3. Turn ON the power to the indoor and outdoor units.
4. On the outdoor unit control PCB, short-circuit the automatic address pin (CN51) for 1 second or longer, then release it.

   .

   (Communication for automatic address setting begins.)

   . * To cancel, again short-circuit the automatic address pin (CN51) for 1 second or longer, then pull it out. The LED that indicates that automatic address setting is in progress turns OFF and the process is stopped.

   (Automatic address setting is completed when LEDs 1 and 2 on the outdoor unit control PCB turn OFF.)

   .
5. Operation from the remote controllers is now possible.

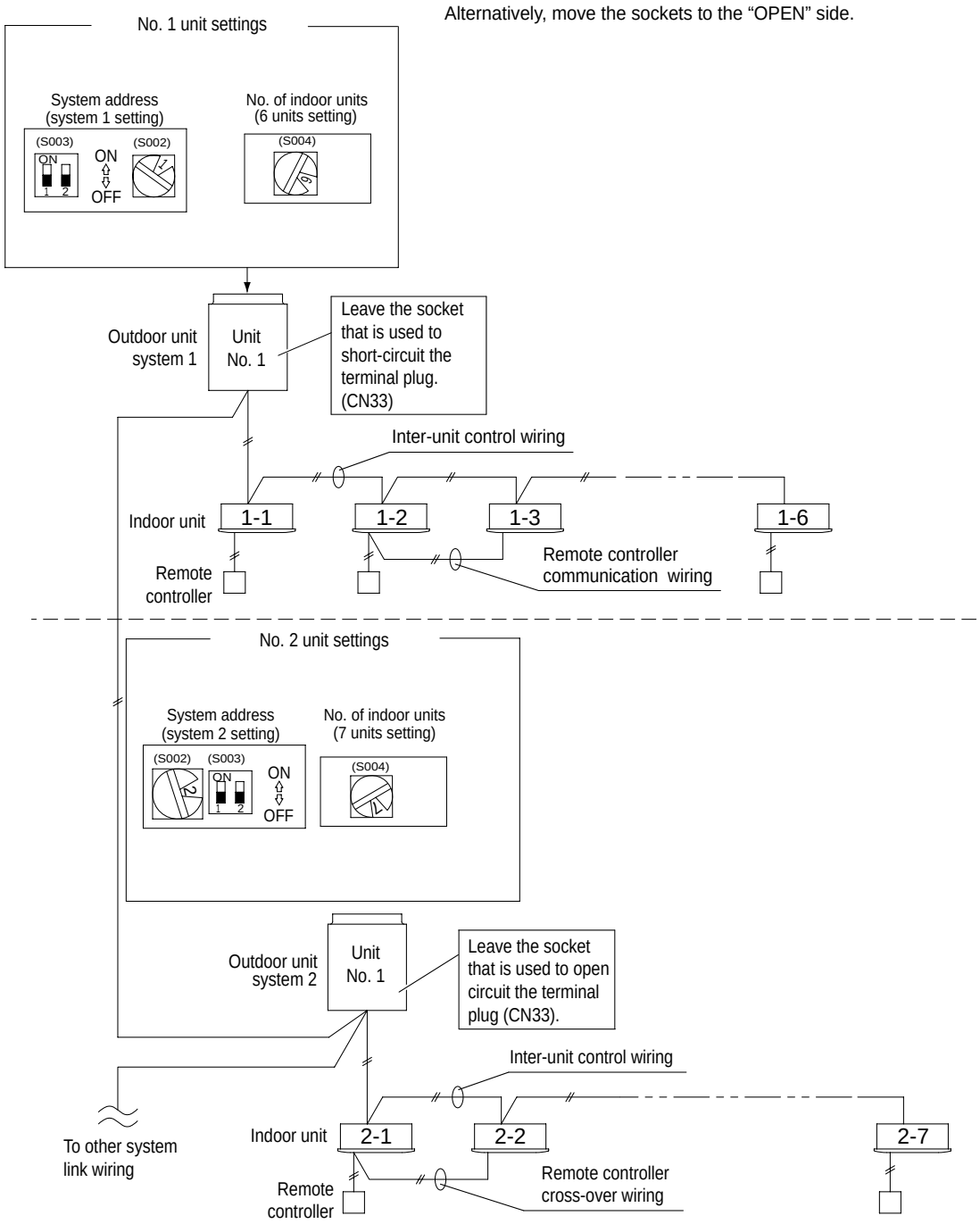
   * To perform automatic address setting from the remote controller, perform steps 1 to 3, then use the remote controller and complete automatic address setting.
   Refer to “Automatic Address Setting from the Remote Controller.”

2. Test Run

Basic wiring diagram: Example (2)

If link wiring is used

* When multiple outdoor units exist, remove the socket that is used to short-circuit the terminal plug (CN33) from all outdoor unit PCBs except for 1.
Alternatively, move the sockets to the “OPEN” side.



Make settings as appropriate for the cases listed below.
(Refer to the instructions on the following pages.)

Indoor and outdoor unit power can be turned ON for each system separately. → Case 1

Indoor and outdoor unit power cannot be turned ON for each system separately.

Automatic address setting in Heating mode → Case 2

Automatic address setting in Cooling mode → Case 3

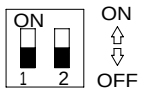
Fig. 5-12

2. Test Run

Case 1 **Automatic Address Setting (no compressor operation)**

Indoor and outdoor unit power can be turned ON for each system separately.
Indoor unit addresses can be set without operating the compressors.

Automatic Address Setting from Outdoor Unit

1. On the outdoor unit control PCB, check that the system address rotary switch (S002) is set to “1” and that the DIP switch (S003) is set to “0.” 

(These are the settings at the time of factory shipment.)
2. To set the number of indoor units that are connected to the outdoor unit to 6, on the outdoor unit control PCB set the No. of indoor units rotary switch (S004) to “6.”
3. At the outdoor unit where all indoor and outdoor unit power has been turned ON, short-circuit the automatic address pin (CN51) for 1 second or longer, then pull it out.

   .

   (Communication for automatic address setting begins.)

   * To cancel, again short-circuit the automatic address pin (CN51) for 1 second or longer, then pull it out.
   . The LED that indicates automatic address setting is in progress turns OFF and the process is stopped.

   (Automatic address setting is completed when LEDs 1 and 2 on the outdoor unit control PCB turn OFF.)

   .
4. Next turn the power ON only for the indoor and outdoor units of the next (different) system. Repeat steps 1 – 3 in the same way to complete automatic address settings for all systems.

   .
5. Operation from the remote controllers is now possible.

* To perform automatic address setting from the remote controller, perform steps 1 and 2, then use the remote controller complete automatic address setting.
Refer to “Automatic Address Setting from the Remote Controller.”

2. Test Run

Case 2 **Automatic Address Setting in Heating Mode**

Indoor and outdoor unit power cannot be turned ON for each system separately.
In the following, automatic setting of indoor unit addresses is not possible if the compressors are not operating.
Therefore perform this process only after completing all refrigerant tubing work.

Automatic Address Setting from Outdoor Unit

1. Perform steps 1 and 2 in the same way as for Case 1.
2. Turn the indoor and outdoor unit power ON at all systems.

   .
3. To perform automatic address setting in Heating mode, on the outdoor unit control PCB in the refrigerant system where you wish to set the addresses, short-circuit the automatic address pin (CN51) for 1 second or longer, then pull it out.
   (Be sure to perform this process for one system at a time. Automatic address settings cannot be performed for more than one system at the same time.)

   .

   (Communication for automatic address setting begins, **the compressors turn ON, and automatic address setting in heating mode begins.**)
   (All indoor units operate.)

   * To cancel, again short-circuit the automatic address pin (CN51) for 1 second or longer, then pull it out.
   The LED that indicates automatic address setting is in progress turns OFF and the process is stopped.

   .

   (Automatic address setting is completed when the compressors stop and LEDs 1 and 2 on the outdoor unit control PCB turn OFF.)
4. At the outdoor unit in the next (different) system, short-circuit the automatic address pin (CN51) for 1 second or longer, then pull it out.

   .

   (Repeat the same steps to complete automatic address setting for all units.)

   .
5. Operation from the remote controllers is now possible.

* To perform automatic address setting from the remote controller, perform steps 1 and 2, then use the remote controller complete automatic address setting.
Refer to “Automatic Address Setting from the Remote Controller.”

2. Test Run

Case 3 **Automatic Address Setting in Cooling Mode**

Indoor and outdoor unit power cannot be turned ON for each system separately.
In the following, automatic setting of indoor unit addresses is not possible if the compressors are not operating.
Therefore perform this process only after completing all refrigerant tubing work.
Automatic address setting can be performed during Cooling operation.

Automatic Address Setting from Outdoor Unit

1. Perform steps 1 and 2 in the same way as for Case 1.
2. Turn the indoor and outdoor unit power ON at all systems.

   .
3. To perform automatic address setting in Cooling mode, on the outdoor unit control PCB in the refrigerant system where you wish to set the addresses, short-circuit the mode change 2P pin (CN50). At the same time, short-circuit the automatic address pin (CN51) for 1 second or longer, then pull it out. (Be sure to perform this process for one system at a time. Automatic address settings cannot be performed for more than one system at the same time.)

   .

   (Communication for automatic address setting begins, **the compressors turn ON, and automatic address setting in Cooling mode begins.**)
   (All indoor units operate.)

   .

   * To cancel, again short-circuit the automatic address pin (CN51) for 1 second or longer, then pull it out. The LED that indicates automatic address setting is in progress turns OFF and the process is stopped.

   (Automatic address setting is completed when the compressors stop and LEDs 1 and 2 on the outdoor unit control PCB turn OFF.)
4. At the outdoor unit in the next (different) system, short-circuit the automatic address pin (CN51) for 1 second or longer, then pull it out.

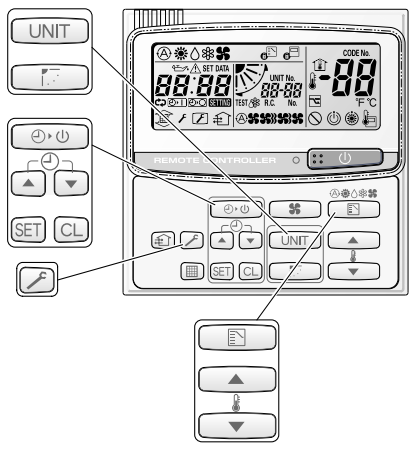
   .

   (Repeat the same steps to complete automatic address setting for all units.)

   .
5. Operation from the remote controllers is now possible.

* Automatic address setting in Cooling mode cannot be done from the remote controller.

Automatic Address Setting from the Remote Controller



Selecting each refrigerant system individually for automatic address setting

---Automatic address setting for each system: Item code “A1”

Press the remote controller timer time ▲ button and ✎ button at the same time. (Press and hold for 4 seconds or longer.)

Next, press either the temperature setting ▲ or ▼ button.
(Check that the item code is “A1.”)

Use either the UNIT or ⊞ button to set the system No. to perform automatic address setting.

Then press the SET button.

(Automatic address setting for one refrigerant system begins.)
(When automatic address setting for one system is completed, the system returns to normal stopped status.) <Approximately 4 – 5 minutes is required.>
(During automatic address setting, “SETTING” is displayed on the remote controller. This message disappears when automatic address setting is completed.)

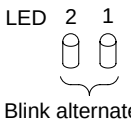
Repeat the same steps to perform automatic address setting for each successive system.

4

2. Test Run

Display during automatic address setting

On outdoor unit PCB



* Do not short-circuit the automatic address setting pin (CN51) again while automatic address setting is in progress. Doing so will cancel the setting operation and will cause LEDs 1 and 2 to turn OFF.

* When automatic address setting has been successfully completed, both LEDs 1 and 2 turn OFF.

* LED 1 is D042. LED 2 is D043.

* If automatic address setting is not completed successfully, refer to the table below and correct the problem. Then perform automatic address setting again.

Display details of LEDs 1 and 2 on the outdoor unit control PCB

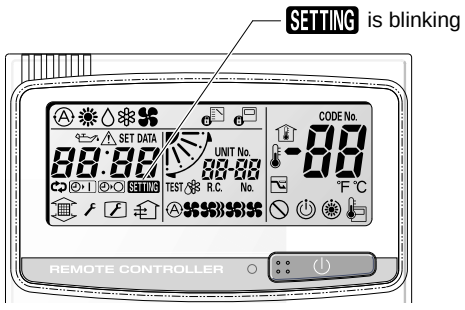
(☼: ON ✷: Blinking ●: OFF)

LED 1	LED 2	Display meaning
☼	☼	After the power is turned ON (and automatic address setting is not in progress), no communication with the indoor units in that system is possible.
●	☼	After the power is turned ON (and automatic address setting is not in progress), 1 or more indoor units are confirmed in that system; however, the number of indoor units does not match the number that was set.
✷ Alternating ✷		Automatic address setting is in progress.
●	●	Automatic address setting completed.
✷ Simultaneous ✷		At time of automatic address setting, the number of indoor units did not match the number that was set. ⚠ (when indoor units are operating) indication appears on the display.
✷ Alternating ✷		Refer to Table of Self-Diagnostic Functions and Description of Alarm Displays.

Note: ⚠ indicates that the solenoid is fused or that there is a CT (current detection circuit) failure (current is detected when the compressor is OFF).

4

Remote controller display during automatic setting



2. Test Run

Request concerning recording the indoor/outdoor unit combination Nos.

After automatic address setting has been completed, be sure to record them for future reference.

List the outdoor unit system address and the addresses of the indoor units in that system in an easily visible location (next to the nameplate), using a permanent marking pen or similar means that cannot be erased easily.

Example: (Outdoor) 1 – (Indoor) 1-1, 1-2, 1-3… (Outdoor) 2 – (Indoor) 2-1, 2-2, 2-3…

These numbers are necessary for later maintenance. Please be sure to indicate them.

Checking the indoor unit addresses

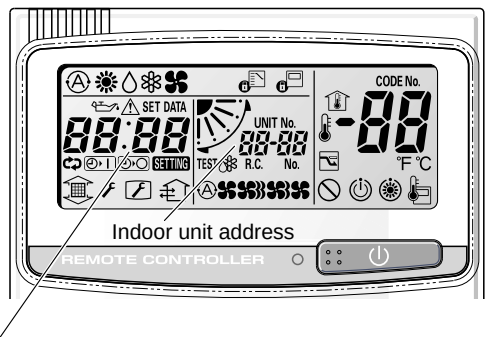
Use the remote controller to check the indoor unit address.

<If 1 indoor unit is connected to 1 remote controller>

1. Press and hold the button and button for 4 seconds or longer (simple settings mode).
2. The address is displayed for the indoor unit that is connected to the remote controller.
   (Only the address of the indoor unit that is connected to the remote controller can be checked.)
3. Press the button again to return to normal remote controller mode.

<If multiple indoor units are connected to 1 remote controller (group control)>

1. Press and hold the button and button for 4 seconds or longer (simple settings mode).
2. “ALL” is displayed on the remote controller.
3. Next, press the UNIT button.
4. The address is displayed for 1 of the indoor units which is connected to the remote controller. Check that the fan of that indoor unit starts and that air is discharged.
5. Press the UNIT button again and check the address of each indoor unit in sequence.
6. Press the button again to return to normal remote controller mode.



Number changes to indicate which indoor unit is currently selected.

Remote Controller Test Run Settings

1. Press the remote controller button for 4 seconds or longer. Then press the button.

   “TEST” appears on the LCD display while the test run is in progress.

   The temperature cannot be adjusted when in Test Run mode.
   (This mode places a heavy load on the machines. Therefore use it only when performing the test run.)
2. The test run can be performed using the HEAT, COOL, or FAN operation modes.
   Note: The outdoor units will not operate for approximately 3 minutes after the power is turned ON and after operation is stopped.
3. If correct operation is not possible, a code is displayed on the remote controller display.
   (Refer to “2-6. Meaning of Alarm Messages” and correct the problem.)
4. After the test run is completed, press the button again. Check that “TEST” disappears from the remote controller display.

   (To prevent continuous test runs, this remote controller includes a timer function that cancels the test run after 60 minutes.)

* If the test run is performed using the wired remote controller, operation is possible even if the cassette-type ceiling panel has not been installed. (“P09” display does not occur.)

2. Test Run

2-5. Caution for Pump Down

Pump down means refrigerant gas in the system is returned to the outdoor unit. Pump down is used when the unit is to be moved, or before servicing the refrigerant circuit.

This outdoor unit cannot collect more than the rated refrigerant amount as shown by the nameplate on the back.

If the amount of refrigerant is more than that recommended, do not conduct pump down. In this case use another refrigerant collecting system.

2-6. Meaning of Alarm Messages

Table of Self-Diagnostics Functions and Description of Alarm Displays

Alarm messages are indicated by the blinking of LED 1 and 2 (D72, D75) on the outdoor unit PCB. They are also displayed on the wired remote controller.

Viewing the LED 1 and 2 (D72 and D75) alarm displays

LED 1	LED 2	Alarm contents
☼	☼	Alarm display LED 1 blinks M times, then LED 2 blinks N times. The cycle then repeats. M = 2: P alarm 3: H alarm 4: E alarm 5: F alarm 6: L alarm N = Alarm No. Example: LED 1 blinks 2 times, then LED 2 blinks 17 times. The cycle then repeats. Alarm is “P17.”
Alternating		

(☼ : Blinking)

Possible cause of malfunction			Alarm message
Serial communication errors Mis-setting	Remote controller is detecting error signal from indoor unit.	Error in receiving serial communication signal. (Signal from main indoor unit in case of group control) Ex: Auto address is not completed.	<E01>
		Error in transmitting serial communication signal.	<E02>
	Indoor unit is detecting error signal from remote controller (and system controller).		<<E03>>
	Indoor unit is detecting error signal from outdoor unit.	Error in receiving serial communication signal. When turning on the power supply, the number of connected indoor units does not correspond to the number set. (Except R.C. address is “0.”)	E04
		Error of the outdoor unit in receiving serial communication signal from the indoor unit.	<E06>
	Improper setting of indoor unit or remote controller.	Indoor unit address setting is duplicated.	E08
		Remote controller address connector (RCU. ADR) is duplicated. (Duplication of main remote controller)	<<E09>>
	During auto. address setting, number of connected units does not correspond to number set. When turning on the power supply, number of connected units does not correspond to number set. (Except R.C. address is “0.”)	Starting auto. address setting is prohibited. This alarm message shows that the auto address connector CN100 is shorted while other RC line is executing auto address operation.	E12
		Error in auto. address setting. (Number of connected indoor units is less than the number set)	E15
		Error in auto. address setting. (Number of connected indoor units is more than the number set)	E16
		No indoor unit is connected during auto. address setting.	E20
		Error of outdoor unit address setting.	E25
	Indoor unit communication error of group control wiring.	Error of main indoor unit in receiving serial communication signal from sub indoor units.	E18

Continued

2. Test Run

Possible cause of malfunction				Alarm message
Serial communication errors Mis-setting	Improper setting.	This alarm message shows when the indoor unit for multiple-use is not connected to the outdoor unit.		L02
		Duplication of main indoor unit address setting in group control.		<L03>
		Duplication of outdoor R.C. address setting.		L04
		There are 2 or more indoor units controllers which have operation mode priority in refrigerant circuit.	Priority set remote controller	L05
			Non-priority set remote controller	L06
		Group control wiring is connected to individual control indoor unit.		L07
		Indoor unit address is not set.		L08
		Capacity code of indoor unit is not set.		<<L09>>
		Capacity code of outdoor unit is not set.		L10
		Mis-matched connection of outdoor units which have different kinds of refrigerant.		L17
		4-way valve operation failure		L18
Activation of protective device	Protective device in indoor unit is activated.	Thermal protector in indoor unit fan motor is activated.		<<P01>>
		Improper wiring connections of ceiling panel.		<<P09>>
		Float switch is activated.		<<P10>>
		Power supply voltage is unusual. (The voltage is more than 260 V or less than 160 V between L and N phase.)		P02
		Incorrect discharge temperature. (Comp. No. 1)		P03
		Operation of O_2 sensor		P14
		Outdoor unit fan motor is unusual.		P22
		Compressor running failure resulting from missing phase in the compressor wiring, etc. (Start failure not caused by IPM or no gas.)		P16
		Overcurrent at time of compressor runs more than 80Hz (DCCT secondary current or ACCT primary current is detected at a time other than when IPM has tripped.)		P26
		IPM trip (IPM current or temperature)		H31
		Inverter for compressor is unusual. (DC compressor does not operate.)		P29
Thermistor fault	Indoor thermistor is either open or damaged.	Indoor coil temp. sensor (E1)		<<F01>>
		Indoor coil temp. sensor (E2)		<<F02>>
		Indoor coil temp. sensor (E3)		<<F03>>
		Indoor suction air (room) temp. sensor (TA)		<<F10>>
		Indoor discharge air temp. sensor (BL)		<<F11>>
	Outdoor thermistor is either open or damaged.	Compressor discharge gas temp. sensor (TD)		F04
		Outdoor No. 1 coil liquid temp. sensor (C1)		F07
		Outdoor air temp. sensor (TO)		F08
		Compressor suction port temperature sensor (TS)		F12
		High pressure sensor		F16
EEPROM on indoor unit PCB failure				F29
Protective device for compressor is activated	Protective device for compressor No. 1 is activated.	EEPROM on the outdoor unit PCB is a failure.		F31
		Current is not detected when comp. is ON.		H03

3. Electrical Wiring

3-1. General Precautions on Wiring

(1) Before wiring, confirm the rated voltage of the unit as shown on its nameplate, then carry out the wiring closely following the wiring diagram.

(2) Provide a power outlet to be used exclusively for each unit, and a power supply disconnect and circuit breaker for overcurrent protection should be provided in the exclusive line.

(3) To prevent possible hazards from insulation failure, the unit must be grounded.

(4) Each wiring connection must be done in accordance with the wiring system diagram. Wrong wiring may cause the unit to misoperate or become damaged.

(5) Do not allow wiring to touch the refrigerant tubing, compressor, or any moving parts of the fan.

(6) Unauthorized changes in the internal wiring can be very dangerous. The manufacturer will accept no responsibility for any damage or misoperation that occurs as a result of such unauthorized changes.

(7) Regulations on wire diameters differ from locality to locality. For field wiring rules, please refer to your LOCAL ELECTRICAL CODES before beginning.

You must ensure that installation complies with all relevant rules and regulations.

(8) To prevent malfunction of the air conditioner caused by electrical noise, care must be taken when wiring as follows:

The remote control wiring and the inter-unit control wiring should be wired apart from the inter-unit power wiring.

Use shielded wires for inter-unit control wiring between units and ground the shield on both sides.

(9) If the power supply cord of this appliance is damaged, it must be replaced by a repair shop appointed by the manufacturer, because special purpose tools are required.

3-2. Recommended Wire Length and Wire Diameter for Power Supply System

Outdoor unit

	(A) Power supply		Time delay fuse or circuit capacity
	Wire size	Max. length	
AES 04 MMIH	4 mm^2	16 m	25 A
AES 05 MMIH	6 mm^2	24 m	35 A
AES 06 MMIH	6 mm^2	20 m	35 A

Indoor unit

Type	(B) Power supply	Time delay fuse or circuit capacity
	2.5 mm^2	
AWS	Max. 150 m	10 ~ 16A
ACS,ASS,ADS,FC,SD	Max. 130 m	10 ~ 16A
ADPS	Max. 60 m	10 ~ 16A

Control wiring

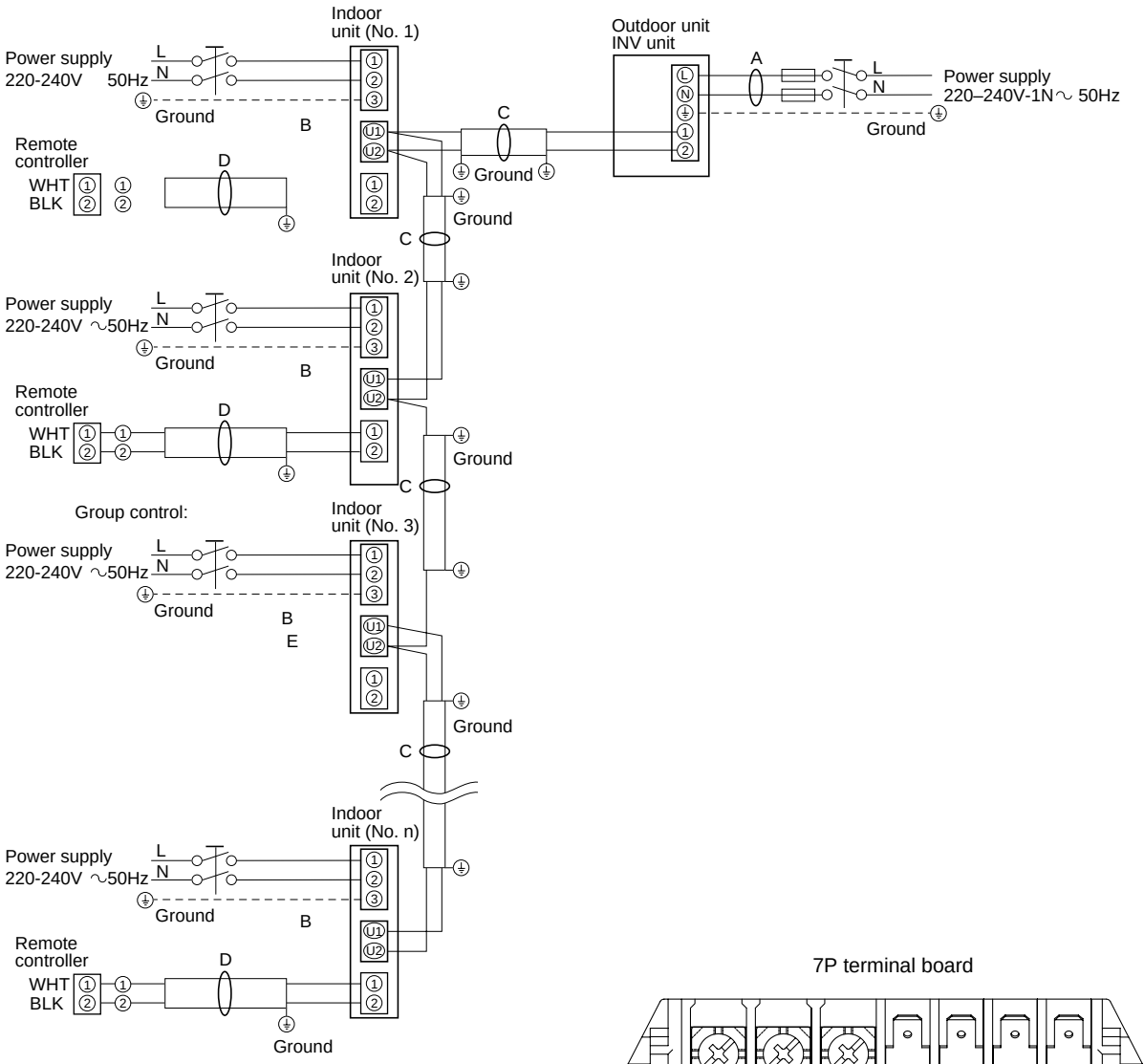
(C) Inter-unit (between outdoor and indoor units) control wiring	(D) Remote control wiring	(E) Control wiring for group control
0.75 mm^2 (AWG #18) **Use shielded wiring***	0.75 mm^2 (AWG #18) **Use shielded wiring**	0.75 mm^2 (AWG #18) **Use shielded wiring**
Max. 1,000 m	Max. 500 m	Max. 500 m (Total)

NOTE

* With ring-type wire terminal.

3. Electrical Wiring

3-3. Wiring System Diagram



NOTE

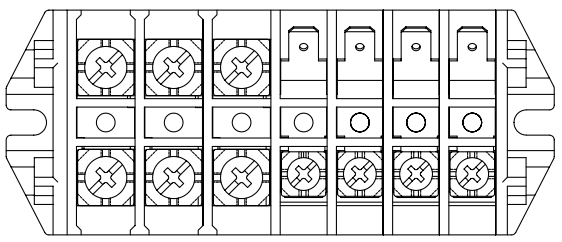
(1) Refer to Section 3-2. “Recommended Wire Length and Wire Diameter for Power Supply System” for the explanation of “A,” “B,” “C,” “D,” and “E,” in the above diagram.

(2) The basic connection diagram of the indoor unit shows the 7P terminal board, so the terminal boards in your equipment may differ from the diagram.

(3) Refrigerant Circuit (R.C.) address should be set before turning the power on.

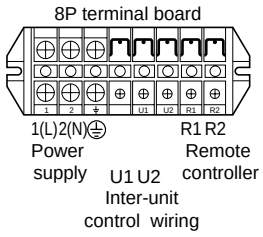
(4) Regarding the R.C. address setting, refer to page **5**-8. Auto. address setting can be executed by remote controller automatically. Refer to page **5**-9 – **5**-13.

7P terminal board



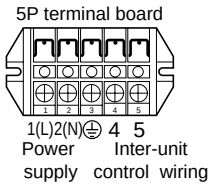
***** Type**

8P terminal board



ASS,ADS,ACS,FC,SD

5P terminal board



AWS Type

3. Electrical Wiring

CAUTION

(1) When linking outdoor units in a network (S-net link system), disconnect the terminal extended from the short plug (CN003, 2P Black, location: right bottom on the outdoor main control PCB) from all outdoor units except any one of the outdoor units.
(When shipping: In shorted condition.)

Otherwise the communication of S-net link system is not performed. For a system without link (no connection wiring between outdoor units), do not remove the short plug.

(2) Do not install the inter-unit control wiring in a way that forms a loop. (Fig. 5-13)

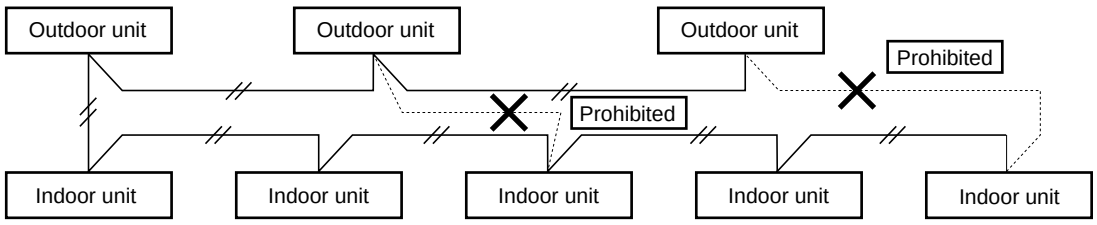


Fig. 5-13

(3) Do not install inter-unit control wiring such as star branch wiring. Star branch wiring causes mis-address setting.

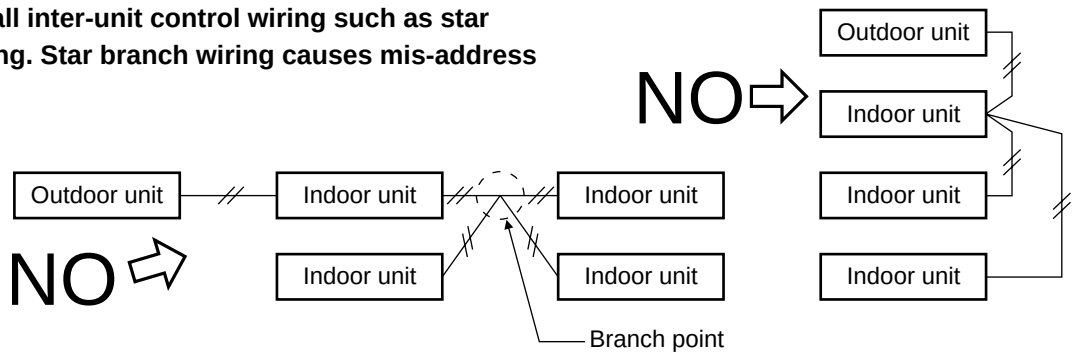


Fig. 5-14

(4) If branching the inter-unit control wiring, the number of branch points should be 16 or fewer. (Branches less than 1 m are not included in the total branch number.) (Fig. 5-15)

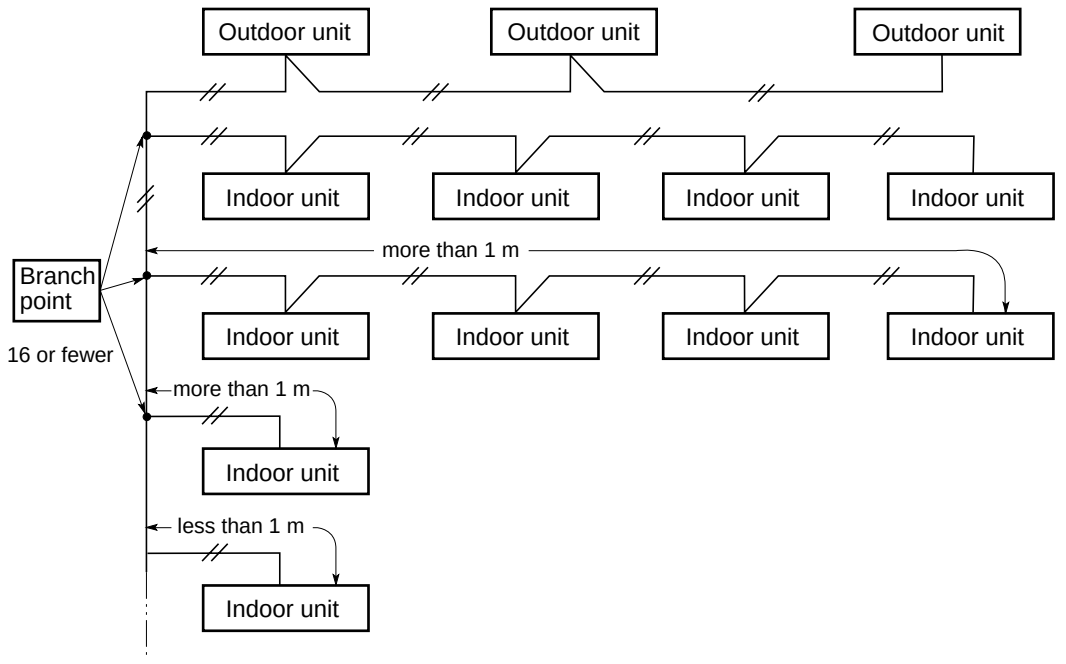


Fig. 5-15

3. Electrical Wiring

(5) Use shielded wires for inter-unit control wiring (c) and ground the shield on both sides, otherwise misoperation from noise may occur. (Fig. 5-16)
Connect wiring as shown in Section "3-3. Wiring System Diagram."

WARNING

Loose wiring may cause the terminal to overheat or result in unit malfunction. A fire hazard may also exist. Therefore, ensure that all wiring is tightly connected.

When connecting each power wire to the terminal, follow the instructions on "How to connect wiring to the terminal" and fasten the wire securely with the fixing screw of the terminal plate.

How to connect wiring to the terminal

For stranded wiring

(1) Cut the wire end with cutting pliers, then strip the insulation to expose the stranded wiring about 10 mm and tightly twist the wire ends. (Fig. 5-17)

(2) Using a Phillips head screwdriver, remove the terminal screw(s) on the terminal plate.

(3) Using a ring connector fastener or pliers, securely clamp each stripped wire end with a ring pressure terminal.

(4) Place the ring pressure terminal, and replace and tighten the removed terminal screw using a screwdriver. (Fig. 5-18)

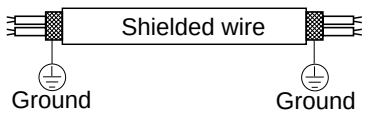


Fig. 5-16

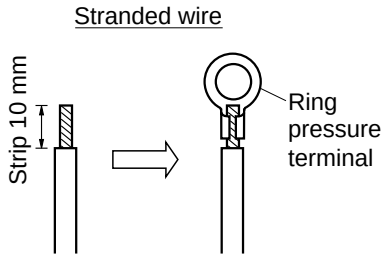


Fig. 5-17

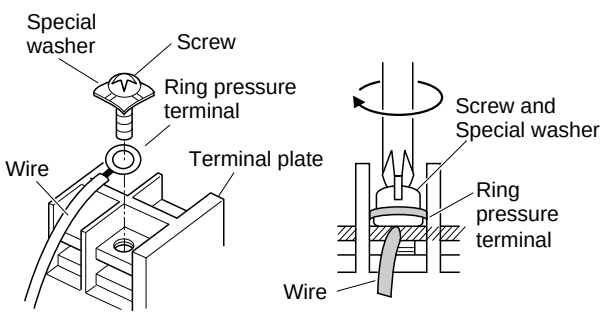


Fig. 5-18

4. Installation Standards

4-1. Check of Density Limit

The room in which the air conditioner is to be installed requires a design that in the event of refrigerant gas leaking out, its density will not exceed a set limit.

The refrigerant (R410A), which is used in the air conditioner, is safe, without the toxicity or combustibility of ammonia, and is not restricted by laws imposed to protect the ozone layer. However, since it contains more than air, it poses the risk of suffocation if its density should rise excessively. Suffocation from leakage of refrigerant is almost non-existent. With the recent increase in the number of high density buildings, however, the installation of multi air conditioner systems is on the increase because of the need for effective use of floor space, individual control, energy conservation by curtailing heat and carrying power, etc.

Most importantly, the multi air conditioner system is able to replenish a large amount of refrigerant compared to conventional individual air conditioners. If a single unit of the multi air conditioner system is to be installed in a small room, select a suitable model and installation procedure so that if the refrigerant accidentally leaks out, its density does not reach the limit (and in the event of an emergency, measures can be made before injury can occur).

In a room where the density may exceed the limit, create an opening with adjacent rooms, or install mechanical ventilation combined with a gas leak detection device. The density is as given below.

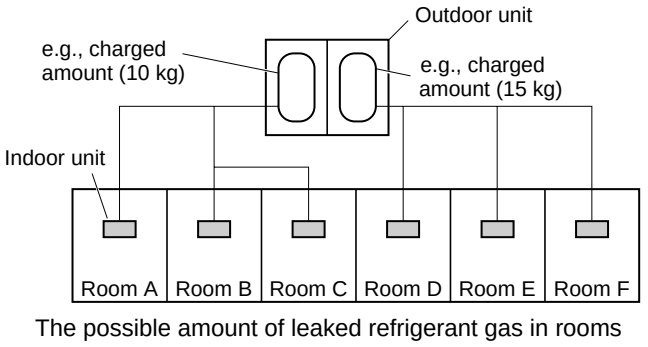
$$\frac{\text{Total amount of refrigerant (kg)}}{\text{Min. volume of the indoor unit installed room (m}^3\text{)}} = \text{Density limit (kg/m}^3\text{)}$$

The density limit of refrigerant which is used in multi air conditioners is 0.3 kg/m^3 (ISO 5149).

NOTE

1. If there are 2 or more refrigerating systems in a single refrigerating device, the amount of refrigerant should be as charged in each independent device.

For the amount of charge in this example:

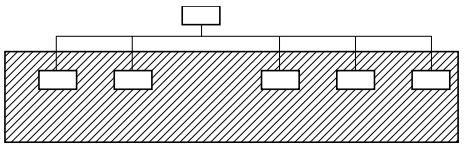


The possible amount of leaked refrigerant gas in rooms A, B and C is 10 kg.

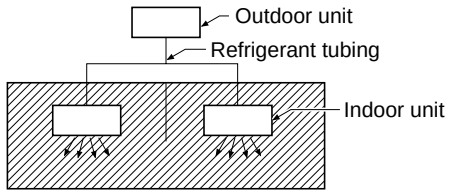
The possible amount of leaked refrigerant gas in rooms D, E and F is 15 kg.

2. The standards for minimum room volume are as follows.

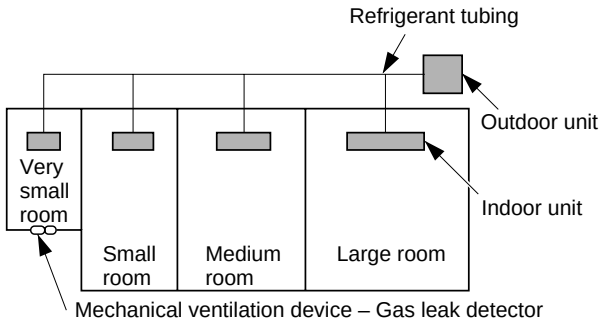
(1) No partition (shaded portion)



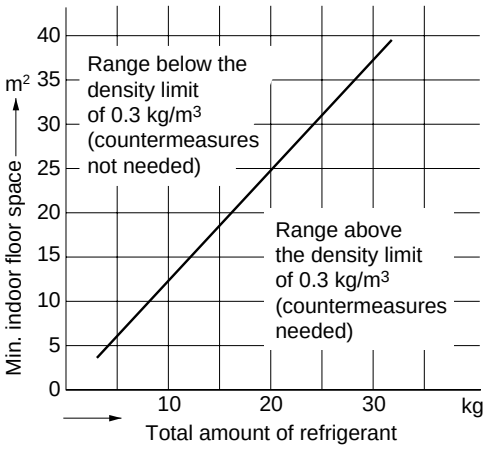
(2) When there is an effective opening with the adjacent room for ventilation of leaking refrigerant gas (opening without a door, or an opening 0.15% or larger than the respective floor spaces at the top or bottom of the door).



(3) If an indoor unit is installed in each partitioned room and the refrigerant tubing is interconnected, the smallest room of course becomes the object. But when mechanical ventilation is installed interlocked with a gas leakage detector in the smallest room where the density limit is exceeded, the volume of the next smallest room becomes the object.



3. The minimum indoor floor space compared with the amount of refrigerant is roughly as follows (when the ceiling is 2.7 m high):



4. Installation Standards

4-2. Precautions for Installation Using New Refrigerant

4-2-1. Care regarding tubing

(1) Process tubing

Material: Use C1220 phosphorous deoxidized copper specified in JIS H3300 “Copper and Copper Alloy Seamless Pipes and Tubes.”

Tubing size: Be sure to use the sizes indicated in the table below.

Use a tube cutter when cutting the tubing, and be sure to remove any flash. This also applies to distribution joints (optional).

When bending tubing, use a bending radius that is 4 times the outer diameter of the tubing or larger.

CAUTION

Use sufficient care in handling the tubing. Seal the tubing ends with caps or tape to prevent dirt, moisture, or other foreign substances from entering. These substances can result in system malfunction.

Unit: mm

Material		O				
Copper tube	Outer diameter	6.35	9.52	12.7	15.88	19.05
	Wall thickness	0.8	0.8	0.8	1.0	1.0

(2) Prevent impurities including water, dust and oxide from entering the tubing. Impurities can cause R410A refrigerant deterioration and compressor defects. Due to the features of the refrigerant and refrigerating machine oil, the prevention of water and other impurities becomes more important than ever.

4-2-2. Be sure to recharge the refrigerant only in liquid form.

(1) Since R410A is a non-azeotrope, recharging the refrigerant in gas form can lower performance and cause defects of the unit.

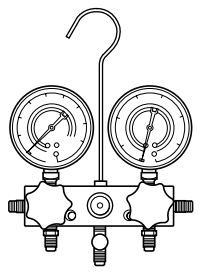
(2) Since refrigerant composition changes and performance decreases when gas leaks, collect the remaining refrigerant and recharge the required total amount of new refrigerant after fixing the leak.

4-2-3. Different tools required

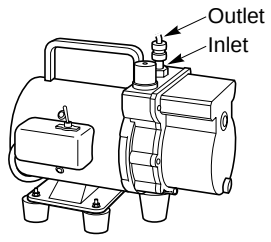
(1) Tool specifications have been changed due to the characteristics of R410A.
Some tools for R22- and R407C-type refrigerant systems cannot be used.

Item	New tool?	R407C tools compatible with R410A?	Remarks
Manifold gauge	Yes	No	Types of refrigerant, refrigerating machine oil, and pressure gauge are different.
Charge hose	Yes	No	To resist higher pressure, material must be changed.
Vacuum pump	Yes	Yes	Use a conventional vacuum pump if it is equipped with a check valve. If it has no check valve, purchase and attach a vacuum pump adapter.
Leak detector	Yes	No	Leak detectors for CFC and HCFC that react to chlorine do not function because R410A contains no chlorine. Leak detector for HFC134a can be used for R410A.
Flaring oil	Yes	No	For systems that use R22, apply mineral oil (Suniso oil) to the flare nuts on the tubing to prevent refrigerant leakage. For machines that use R407C or R410A, apply synthetic oil (ether oil) to the flare nuts.

Manifold gauge



Vacuum pump

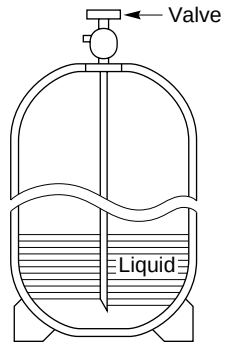


* Using tools for R22 and R407C and new tools for R410A together can cause defects.

(2) Use R410A exclusive cylinder only.

Single-outlet valve

(with siphon tube)
Liquid refrigerant should be recharged with the cylinder standing on end as shown.



argoclima s.p.A.

Via Varese, 90 - 21013 Gallarate - Va - Italy
Tel. +39 0331 755111 - Fax +39 0331 776240
www.argoclima.com